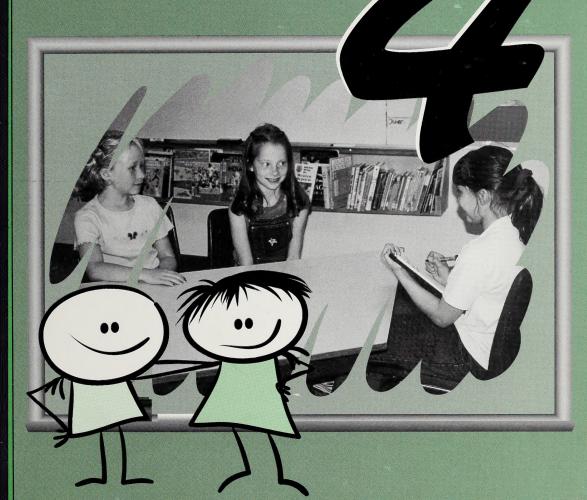
iversity of Alberta Library
1620 3452419 7

Jathematics

Module 1



Data Management

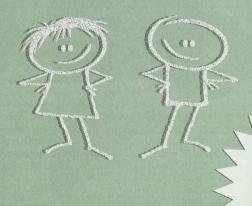


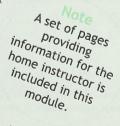


Digitized by the Internet Archive in 2016 with funding from University of Alberta Libraries

# Mathematics 4

# Module 1 Data Management









Mathematics 4 Module 1: Data Management Student Module Booklet Learning Technologies Branch ISBN 0-7741-1597-1

This document is intended	for
Students	1
Teachers	1
Administrators	
Home Instructors	1
General Public	
Other	



The Learning Technologies Branch has an Internet site that you may find useful. The address is as follows:

http://www.learning.gov.ab.ca/ltb

The use of the Internet is optional. Exploring the electronic information superhighway can be educational and entertaining. However, be aware that these computer networks are not censored. Students may unintentionally or purposely find articles on the Internet that may be offensive or inappropriate. As well, the sources of information are not always cited and the content may not be accurate. Therefore, students may wish to confirm facts with a second source.

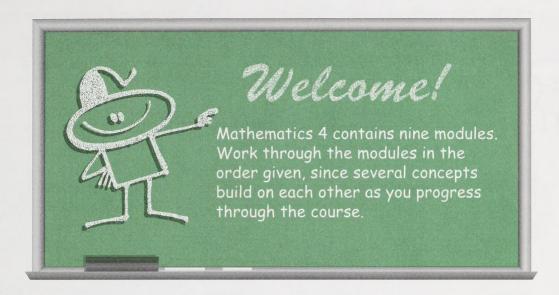
### **ALL RIGHTS RESERVED**

Copyright © 2000, the Crown in Right of Alberta, as represented by the Minister of Learning, Alberta Learning, 11160 Jasper Avenue, Edmonton, Alberta T5K 0L2. All rights reserved. Additional copies may be obtained from the Learning Resources Distributing Centre.

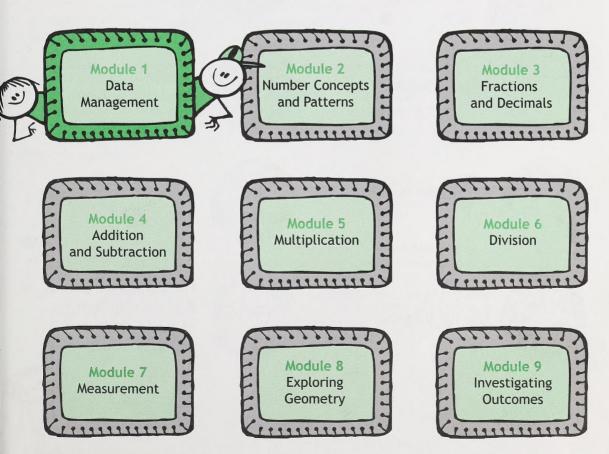
No part of this courseware may be reproduced in any form, including photocopying (unless otherwise indicated), without the written permission of Alberta Learning.

Every effort has been made both to provide proper acknowledgement of the original source and to comply with copyright law. If cases are identified where this effort has been unsuccessful, please notify Alberta Learning so that appropriate corrective action can be taken.

IT IS STRICTLY PROHIBITED TO COPY ANY PART OF THESE MATERIALS UNDER THE TERMS OF A LICENCE FROM A COLLECTIVE OR A LICENSING BODY.



# Mathematics 4





The book you are presently reading is called a Student Module Booklet. You will find icons used throughout it. Read the following explanations to find out what each icon tells you to do.



Pay close attention to important words or ideas.



Refer to the textbook

Quest 2000: Exploring

Mathematics.



Use manipulatives, cut-out learning aids, or pull-out pages.



Do an activity to review the concept.



Use a calculator.



Prepare to do a Challenge activity.



Do an activity just for fun!



Do an activity with your home instructor.



Use the Internet.



Use the Answer Key to Self-Marking Activities in the Appendix to correct activities.



### Information for the Home Instructor

### A New Way of Thinking About Mathematics

This Grade 4 mathematics course reflects a new philosophy in the teaching and learning of mathematics. Traditionally, mathematics has been about memorizing rules, reciting number facts, and solving problems using the one "right" method.

The emphasis now is for students to understand mathematics, to make it meaningful to their own lives, and to communicate and reason mathematically about what they are learning. Simply being able to do adding, subtracting, multiplying, and dividing does not ensure a student's ability to know how to use these skills in problem-solving situations in mathematics.

An important goal of Mathematics 4 is to improve the student's ability in mathematics so that he or she can use mathematics confidently to solve problems in both school-setting and real-life situations.

### **Using Manipulatives**

Manipulatives are an important tool for helping students understand mathematical concepts. They can and should be used at all grade levels, especially when new concepts are being introduced. Studies have shown that the use of manipulatives is beneficial to most children because it leads to clearer understanding and to greater success in learning more abstract thoughts and skills.

As the student works through each module, he or she will be asked to turn to the Appendix to cut out various hands-on learning materials. Ensure that the student does this, following the directions provided. If you have access to actual math manipulatives (such as a base ten kit), certainly these should be used in lieu of the cut-out models found in the Appendix.



### **Using Calculators**



Throughout Mathematics 4, students will require the use of a calculator. The calculator should be regarded as a tool and be made available for student use when doing mathematics.

Calculators are useful in performing cumbersome calculations, exploring number patterns, and discovering number relationships. However, calculators should not become a crutch that students rely upon for doing all of their calculations. Estimation and mental calculation are skills that rely greatly upon mastery of the basic number facts. Thus, mastery of the basic facts in addition, subtraction, multiplication, and division remains an important goal of Mathematics 4.

### **Practising Number Facts**



Most students require regular practice in order to master the basic facts for addition, subtraction, multiplication, and division. If the basic facts do not become automatic, students will use up considerable time doing simple calculations at the expense of exploring mathematical concepts and ideas.

The basic facts that each Grade 4 student needs to learn are

- the addition and subtraction facts up to 18 (that is, up to 9 + 9)
- the multiplication and division facts up to 81 (that is, up to  $9 \times 9$ )

Once these facts have been mastered, the student will find

- · tasks involving estimation are easier to do
- more complex calculations requiring adding, subtracting, multiplying, or dividing can be done more quickly and accurately

Regular, daily practice of the number facts is recommended until mastery is achieved. Use of a variety of methods to learn the basic facts is encouraged. These methods might include flash cards, timed drills, games, manipulatives, and computer software programs. Students will also be encouraged to develop personal strategies to assist in learning the number facts causing them difficulty.

The Mathematics Worksheet Factory offers free downloadable worksheets for practice and drill in basic addition, subtraction, multiplication, and division. (Windows 95/98. Not available for Macintosh.)

http://www.worksheetfactory.com/download.html

### **Using Computers**

Computer literacy is a necessary skill in today's society. Students are encouraged to use computers to develop their math skills through the use of software programs and through accessing math sites on the Internet. Selected websites are listed throughout the course to provide activities for the student and ideas for the home instructor. **Note:** If you do not have immediate access to the Internet, you can often find access at your local library. (Some libraries may charge a small fee.)



### Journal Writing

One of the goals in mathematics is for students to be able to communicate mathematical ideas clearly and effectively. Putting into words what they have learned helps students to become aware of what they do and do not know. Through writing, students clarify their understanding and are able to make connections and extend their thinking.

Throughout Mathematics 4, students will be completing journal entries in the Assignment Booklets. As students explain, in their own words, their interpretation or application of a concept or idea, important insight can be gained by the teacher (and by the home instructor) into each student's degree of understanding of mathematical ideas.

### **Problem Solving**

Problem solving is not a distinct topic in the mathematics curriculum; it is a process embedded throughout all strands (number concepts, geometry, operations, data analysis, measurement, and so on). Problem solving provides an opportunity for students to make use of the skills learned and apply their knowledge of concepts in a meaningful way. For the most part, activities in Mathematics 4 focus on problem solving. Problem solving is not designed simply as a means to practise computational skills.

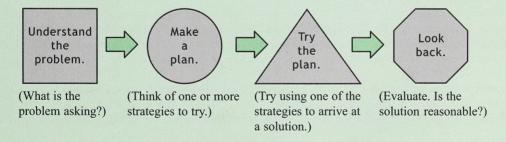
Seven problem-solving strategies that students can use to become better problem solvers have been included in Mathematics 4. They are:

- · acting out the problem
- · guessing and checking
- · making an organized list
- · drawing a diagram
- · making a table or chart
- · looking for a pattern
- · making it simpler

Students are introduced to these strategies throughout the course. However, many students intuitively use some or all of these strategies already. (For a more detailed description of these strategies, see the Appendix in Module 1.)

What is most important is that students realize that there is no one "right" way to solve any particular problem. Often, the student will be asked to think of more than one way to solve a problem; or the student may be requested to ask you, the home instructor, to share a method you might use to solve the same problem. Students are led to realize that, as in real life, there is usually more than one possible method or strategy for solving a problem.

Whatever strategies are employed, the following problem-solving process has been used successfully to help students organize their efforts at solving a wide variety of problems:



### Assessment and Evaluation

A broad range of assessment tools will be used to gather information for the purpose of evaluating the student's knowledge and understanding of curriculum skills and concepts. It is important that the teacher learn how students think about mathematics as well as what concepts and skills they have mastered. Some or all of the following assessment tools may be used:

- Assignment Booklet questions
- · journal entries
- performance assessments
- · observations by the home instructor
- student self-evaluation pages
- · final test

In order to give the student and home instructor feedback on the student's current level of achievement throughout the school year, the student's teacher will provide written comments and assign a grade at the end of each module. The mark for each module will be determined primarily by how well the student completes the assignments in the Assignment Booklets. However, other broad-based assessment techniques (journal entries, performance assessments, and so on) may also be used.

### Performance Assessment

As the home instructor, you play an important role in student assessment by helping the teacher understand how the student learns and by making the teacher aware of any difficulties the student may be experiencing. This information will also assist the teacher in recommending alternate learning strategies for you to try with the student.

Every few weeks you will be asked to participate in an activity with the student in which you observe and record the strategies he or she uses to complete a task. These performance assessments allow you to observe how the student thinks when working through an assigned task. Suggested assessment questions and prompts will be given to help you assess the student's understanding. A short checklist may also be included for you to complete. In addition, space will be provided for any additional information or comments you would like to add regarding the student's knowledge or understanding.

As the home instructor, you will also benefit from the information recorded on the Assessment Checklist. Checklist items indicated as NOT YET mastered may indicate the student is experiencing difficulty with concepts presented in the course. If so, you may wish to do one or more of the following:

- Revisit with the student the sections of the module where those concepts are introduced.
- · Have the student complete the additional practice exercises found in the Taking Another Look sections.
- Ensure that all pages in the Student Module Booklet are being completed. (This is especially important if the student has been working on the course independently.)
- Check to see that the student is reading and understanding the material that is presented each day. Students with low reading ability may require additional assistance in working through both the Student Module Booklets and the Assignment Booklets.

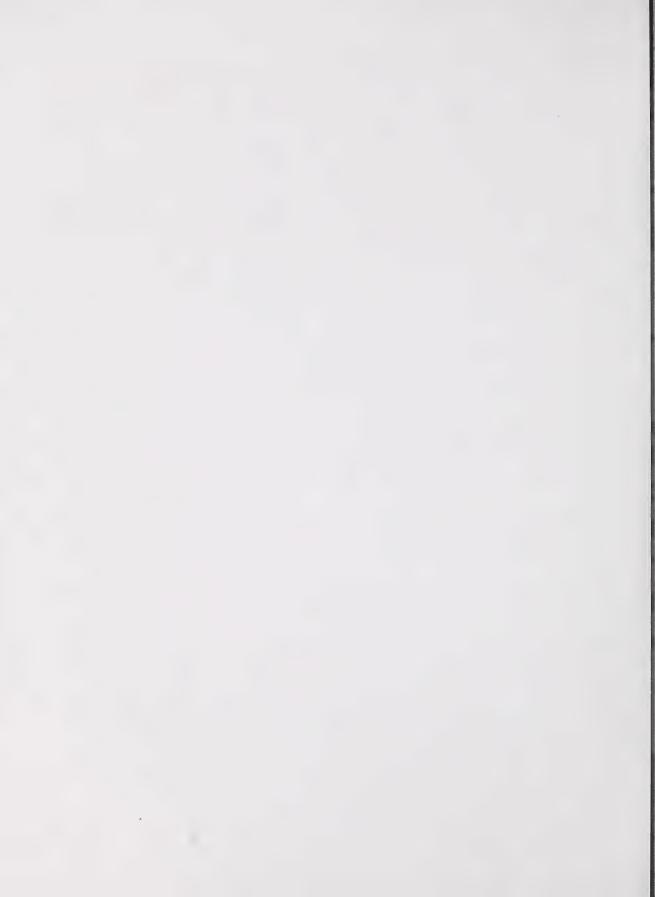
### Helping the Student with Mathematics

As the home instructor, you have an important role to play in ensuring that the student has a successful experience with mathematics in Grade 4. The following are a number of things you can do to foster a positive attitude in the student:

- Make yourself available to the student when he or she is working on mathematics each day. In many lessons, the student will find one or more activities that state, "Discuss your thinking with your home instructor."
- Take time to listen to and discuss the things the student is learning. Use prompts such as
  - "What do you think?"
  - "Why?"
  - "Can you explain your thinking?"
  - "How did you decide that?"



- Ask the student to share his or her journal entries with you. Discuss the ideas, ask for clarification, and share your own ideas.
- Make sure the student follows a regular schedule. Ensure that he or she does some mathematics coursework each day.
- If the student is experiencing difficulty with a particular concept, guide the student to the extra practice exercises provided throughout each module under the heading, "Taking Another Look." These are optional exercises designed for students who require additional practice or for students who are simply looking for a way to review the concepts covered.
- Follow the guidelines set out in the course for sending in the Assignment Booklets. Once an Assignment Booklet has been completed, it should be sent in as soon as possible. The student stands to benefit most from the comments by the teacher when the Assignment Booklet is sent in and returned immediately after the work is completed.
- Whenever possible use manipulatives as a teaching tool to help the student understand a particular concept or idea. Also, ask the student to use manipulatives, whenever possible, when explaining to you his or her own understanding of concepts learned.
- Share your ideas and ways of doing mathematics with the student. Make him or her aware that, in problem solving, there is usually more than one way to solve a mathematical problem. Make use of the section called Problem-Solving Strategies in the Appendix of Module 1 when helping the student learn different ways to solve problems.





# Information for the Student

The Grade 4 Mathematics course is designed to keep you actively involved in learning as you progress through the daily lessons in each of the nine modules. Besides the Student Module Booklets, you will also need a copy of the Grade 4 Mathematics textbook called *Quest 2000: Exploring Mathematics*. The textbook contains pictures, information, questions, and problems that are referred to in the modules. Each module also requires you to complete one or more Assignment Booklets to be sent to your teacher for marking.

# Manipulatives

Manipulatives are hands-on materials that you will be using to help you learn new concepts and ideas. They include things like base ten blocks, geoboards, spinners, counters, polygon shapes, tiles, rulers, and metre-sticks. Don't worry if you don't have all of these manipulatives. Some can be found in the Cut-Out Learning Aids section of the Appendix in several of the modules. Some you may be asked



to make from materials found in your own home. However, it is highly recommended that you have a set of base ten blocks. They will be used often to help you to understand many new math concepts.

You should use manipulatives whenever you think they will help you understand something new you are learning. Manipulatives can also be useful when you are sharing or discussing what you know with your home instructor.

# Calculators

You will need a calculator for many of the activities in Mathematics 4. It is important to remember that a calculator is a tool to be used when doing difficult calculations and when investigating what numbers can do. Don't rely on the calculator for calculations that you can do in your head. For example, you would not use a calculator when estimating or doing mental math. Both of these activities rely upon mastering the basic number facts.



# **Basic Number Facts**

You will practise the basic facts on several days of each module. Each drill is timed to encourage you to work quickly. At first, you may not do very well because you may not know all of the number facts yet, or you may have forgotten some of the number facts you learned last year. Don't worry. By practising the facts regularly, your scores will improve over time. Strategies to help you learn the number facts will be presented in the lessons.



# Computers

If you have your own computer at home, you may already know some computer software programs that help you to learn mathematics. There are also many websites on the Internet that provide math activities for students to do. Throughout this course, you will find optional activities that refer to software programs and Internet websites. You should do these activities only when you have finished the daily assigned



work. Note: Always check with your home instructor before you log onto the Internet. Remember that any Internet website address given in this module is subject to change.

# Journal Writing

In each Assignment Booklet, you will often be asked to complete a journal entry about something you have been learning in the module. Being able to put into your own words what you have learned is an important skill. It will help you think about what you know as well as help your teacher understand your thinking.

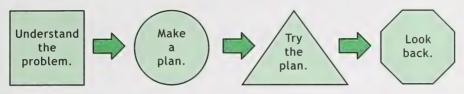


# 9

# Problem-Solving Skills

You are already familiar with problem solving from earlier grades. This course will continue to help you develop strategies to make you a better problem solver. There are four steps that can be used to solve most problems.

# The Four-Step Process



# Step 1

Understand the problem. In this step, you need to spend time reading over the problem in order to understand what you are being asked to find. One way to see if you understand the problem is to cover it up and then try restating it in your own words. Sometimes it might seem like not enough information is given. If this happens, try asking yourself the question, "What do I already know that will help me solve this problem?"

# Step 2

Make a plan. In this step, you decide on the method or strategy you will use to solve the problem. Different problems require different strategies. Most problems can be solved in more than one way. In this course, you will be looking at the following seven strategies:

- acting out the problem
- guessing and checking
- making an organized list
- · drawing a diagram

- making a table or chart
- looking for a pattern
- making it simpler

You will be introduced to these strategies as you move through the modules. However, you may review each of the strategies at any time by turning to the Appendix of Module 1.

Remember, there is no one "right" way to solve a problem. The method or strategy you use may be different than the one your home instructor or someone else doing the problem would use. Sometimes you will find that more than one strategy on the list can be used to solve a problem. In fact, sometimes you may decide to invent a strategy of your own that is not even on the list.

Step 3

Try the plan.

In this step, you try out one of your strategies to see if it works to solve the problem. Don't worry if you can't find the answer immediately. Some problems take more than one step. You may also find it necessary to use your calculator to do some of the calculations.

Sometimes, as you try to solve the problem, you'll find that your strategy isn't working. Don't give up. Try another method instead.

Step 4

Look back. In this step, you take time to look at your answer and ask, "Is my answer reasonable? Does it make sense?" Writing your answer in a complete sentence may help you to see if, in fact, you have answered the question. If not, you may have to check your calculation for errors or, perhaps, try another strategy.

This is also a good time to look at the strategy you used and to think about how you could use it again in other problem-solving situations. Take time to share your strategies with your home instructor, and compare your method with the strategy your home instructor might use.

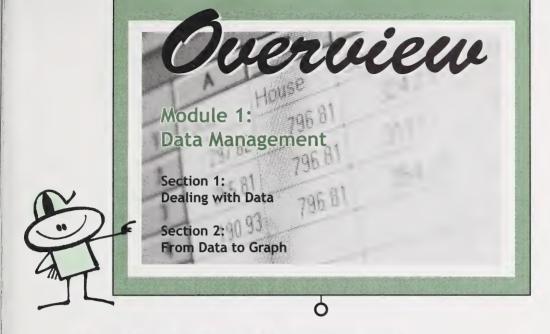


Remember, problem solving is a skill you need and will use throughout your life. The more practice you have with solving problems, the better your problem-solving skills become. Problems don't always have just one "right" answer. Some problems have several possible answers, just as some problems may be solved in several different ways.

# Contents

Module Overview	1
Section 1: Dealing with Data  Day 1: What Is Data Management?  Day 2: Why Data Is Collected.  Day 3: Conducting a Survey.  Day 4: Collecting and Recording Data.  Day 5: Displaying Data.  Day 6: Interpreting Line Plots.  Day 7: Interpreting Bar Graphs and Pictographs  Day 8: Problem Solving.  Day 9: Assessing What You Know (I)	4 9 18 26 35 43 52 61 72
Send in Assignment Booklet 1A.	
Day 13: Observing Events	83 96 107 116 125 131
Send in Assignment Booklet 1B.  Appendix	
Glossary Problem-Solving Strategies Answer Key to Self-Marking Activities Credits Cut-Out Learning Aids Number Facts Progress Chart for Module 1	138 140 172 199





# Module 1: Data Management

Data is information that is collected and used. Data can be found almost anywhere. It's easy to collect a lot of data. The problem for most people is what to do with all the data once they've got it. Deciding how you will handle all the data is called managing the data or data management.

# In this module, you will...

- learn how to collect data
- organize data using charts or tables
- display data using graphs
- read and interpret data in graphs
- review the basic addition and subtraction facts
- learn a problem-solving strategy
- practise mental math skills



There are **two** Assignment Booklets for Module 1. You should send in Assignment Booklet 1A after completing Day 9. You should send in Assignment Booklet 1B after completing Day 17.



# Section 1 Dealing with Data

# Day 1 😭 🖰

# What Is Data Management?



# The Information Age

Have you ever heard someone say

"We live in the Information Age?"

People say this because the world today is filled with so much information. Information is everywhere. You can get information from

- books and newspapers
- radio and TV
- clocks and thermometers
- calculators and computers
- measuring tapes and weigh scales
- maps and pictures
- signs and billboards

# Information that people collect and use is called data.

You can use data that other people have collected or you can collect your own data. You can find data almost anywhere just by looking or asking questions.

Suppose you want to know how many of your friends can juggle. You could find out by asking them. Or, you could give them three balls and watch as they juggle in front of you! The information you collect about juggling is called **data**.

# Data helps you

# make decisions and choices

Listening to the weather report helps you decide whether or not to take a raincoat when you go out. The weather report can also help you decide whether to plan a picnic at the park or a shopping trip to the mall.



# predict whether or not something is likely to happen

When an election is being held, people may be asked of time who they will vote for. This data can help predict who will likely win the election.

# •learn about new things

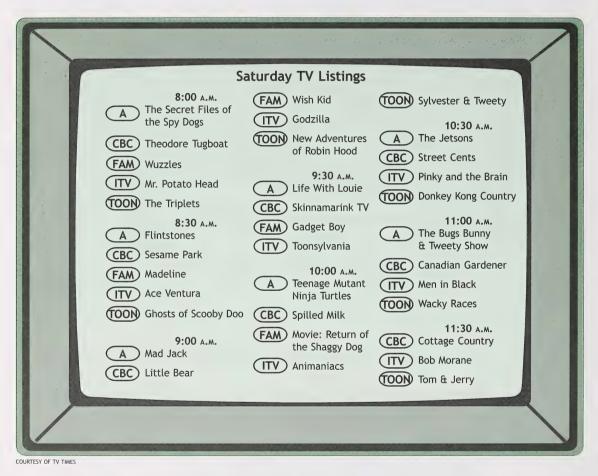
Data can help you learn how things work, what things are popular, and why you should or should not buy something.

Can you see how data is used many ways every day?

# Data Needs to be Organized

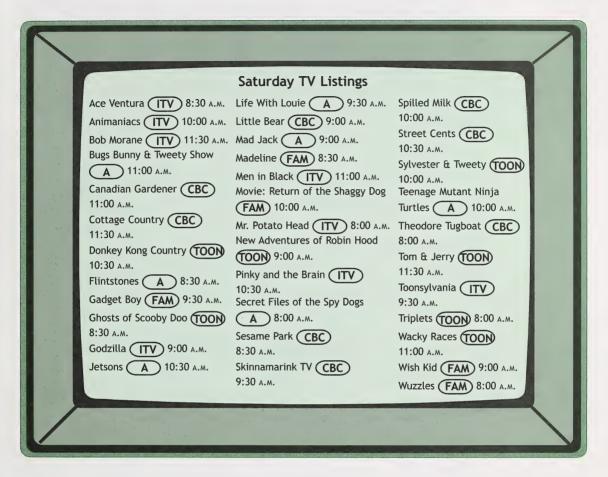
Can you think of a time when you read something that contained a lot of data or information? Was the data carefully organized in a way that made it easy for you to understand and use?

Look at the following TV-program guide.



1. Do you think the data is shown in a way that makes the TV-program guide easy to use? Explain why.

Now look at the TV-program guide that follows. Think about what makes one easier to understand and use than the other.



**2.** What do you notice about the way the data is organized in the second TV-program guide that makes it more difficult to understand and use?



Check your answers in the Appendix.

Because there is so much data around for you to use, you need a way to

collect the data

This means gathering only the data that will be useful to you.

organize and display the data

This means putting data onto a chart or graph for others to learn from.

• interpret the data

This means making sense of the data and using it in different ways

The collecting, organizing, and interpreting of data is known as data management.

In this module you will have the chance to

- collect data
- display data
- interpret data

Sometimes you will collect your own data and organize it into a chart or graph for others to see and learn from. At other times, you will look at data in charts or graphs made by others to learn what their data can tell you. In both cases, you will be making sense of data so that you can use it to answer questions or solve problems.

Turn to Assignment Booklet 1A, and complete the activities for Day 1.



# Why Data Is Collected

In Day 1 you learned that data is used by many people in many ways every day. Today you will look at other ways that data is useful.

# Data Can Be Used to Answer Questions

Data is often collected and used to find the answer to a question.

Look at the following questions. You need data to answer each one.

- Who is the top goal scorer in the NHL?
- What is the most popular TV show on Friday night?
- When is the next full moon?
- Where do most people go skiing in Alberta?
- How many golf balls fit in a 1-litre container?



Perhaps you already know the answer to one of these questions. If so, you already have the data in your head. Do you remember collecting it? Did you read it? Did someone tell you? Do you know from experience?

# Data Can Help You Find the Answer

Suppose you want to answer the question

Who in my family spends the most time reading books in one week?



In order to answer this question, you first need to collect **information** or **data**. You need to find out how much time each family member spends reading each day.

1.	Can you	think	of a	way to	get t	his	data?	Explain	one	method	you	could
	use.											



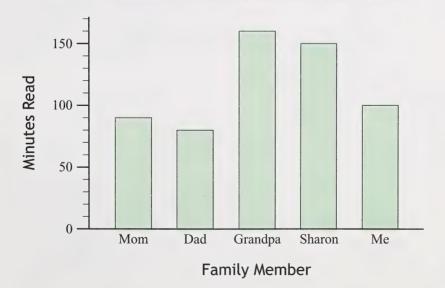
Check your answer in the Appendix.

Once you have collected the data from each person, you can display the information in a chart or table.

B								
	Nι	ımber	of Mi	inutes	Read	l Each	Day	
	S	М	Т	W	Т	F	S	Total
Mom	0	10	15	0	40	25	0	90
Dad	10	15	0	35	20	0	0	80
Grandpa	20	45	45	0	0	20	30	160
Sharon	30	30	35	20	0	25	10	150
Ме	15	20	15	0	15	20	15	100

You could also make a graph showing the time each person spent reading.

# Number of Minutes Read Per Week



Drawing a graph or chart is called displaying the data.

Next, you could show the graph to others, and together you could **interpret the data**. This means looking at the graph to see what the data tells you. The data may answer questions like these:

- Who reads the most?
- Who reads the least?
- Do some read the same amount?
- Do the adults read more or less than the kids?

Interpreting the data allows you and others to make sense of the information you have collected.



# Data Can Help Solve a Problem

Often the first thing people say when they are faced with a problem is

"We need more information."

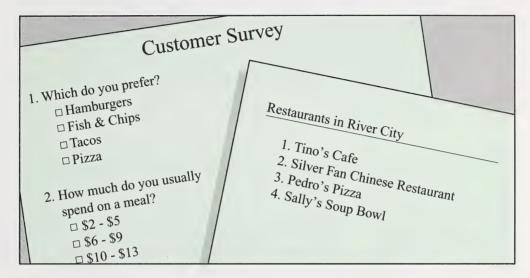
# Example 1

Mr. Gratz is opening a new restaurant. He knows that he wants many customers to eat at his restaurant. Mr. Gratz states his problem.



Mr. Gratz needs three kinds of data:

- what kinds of meals customers prefer
- how much money customers want to spend on a meal
- other kinds of restaurants already in the area



# Example 2

The Truman family wants to take a vacation by car to visit several places in Alberta. The problem they need to solve is

"Which places should we visit during our one-week vacation?"

Mr. Truman asked his son, Freddie, to help plan the trip. "The first thing to do, Freddie, is **gather data**."



"Okay, Dad," replied Freddie. "Since we only have seven days, we'll need to decide on just a few places to visit. I'll make up a list of places and then I'll ask everyone in the family to choose their three favourites."

"Good idea, Freddie. Using that information, you should be able to tell us the three most popular places for our trip." The following table shows the results of Freddie's survey

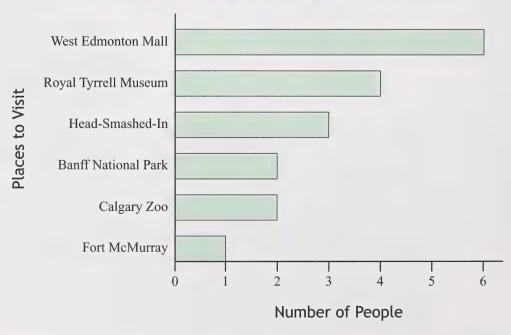
Places to Visit	Tally	Frequency
Banff National Park	11	2
Head-Smashed-In Buffalo Jump	111	3
Fort McMurray	1	1
Royal Tyrrell Museum	1111	4
Calgary Zoo	- 11	2
West Edmonton Mall	1441	6

2. Which three places were most popular with Freddie's family?

•	•	

Next, Freddie decided to **display the data** on a large graph. That way, the information would be easy to see and everyone would be able to see the three most popular choices. Here is the graph Freddie drew.

# Family Choices of Places to Visit in Alberta



	3. Do you think a graph is a good way to share data with other people? Explain your answer.
	Once everyone in the family had seen the graph that Freddie had drawn, they knew right away which places were the most popular choices for their trip. Freddie had made it easy for them to <b>interpret the data</b> .
	"Good job, Freddie," said Mr. Truman. "Now we need to decide how many days we can spend at each place. It's a long way from Head-Smashed-In Buffalo Jump to West Edmonton Mall. You know what that means, don't you?"  "I know I know," replied Freddie. "More data!"
	4. What other data does Freddie need to collect before the Trumans can make final plans for their Alberta holiday?
8	Check your answers in the Appendix.







If you would like to find out more about interesting places in Alberta, here are some Internet sites to visit:

- Alberta Tourism
   http://www.exploreAlberta.com
- Head-Smashed-In Buffalo Jump http://www.head-smashed-in.com
- Royal Tyrrell Museum of Paleontology http://www.tyrrellmuseum.com
- Banff National Park http://www.worldweb.com/ParksCanada-Banff/
- Fort McMurray http://oilsandsdiscovery.com
- West Edmonton Mall http://www.westedmontonmall.com/

# Summing Up

Data management is about

- collecting data or information
- organizing and displaying the data for others to see
- interpreting and using the data for some purpose

Data management is useful for

- answering certain kinds of questions
- solving problems where collecting information is necessary

Turn to Assignment Booklet 1A, and complete the activities for Day 2.





# Conducting a Survey



# People Collect Data for Different Reasons

Data or information can be collected on all sorts of topics.

Data can be collected to find out information

- about people:
  - -favourite music
  - -occupation
  - -address
  - -type of home
  - -favourite sports
  - -computer knowledge

- -favourite foods
- -places visited
- -hobbies
- -clothes worn
- -amount of TV watched
- -schools attended

#### about the environment:

weather patterns
 crops grown
 air pollution
 types of trees
 water quality
 amount of erosion
 animal populations
 amount of rainfall

#### · about an individual person:

-age
-height
-weight
-languages spoken
-mair colour
-gender
-religion

When data is collected, it is usually gathered for a special purpose. You have probably collected data before. If you've ever written a report for school, you likely jotted down bits of information about what you read. Or perhaps you've interviewed people to find out about them or their job. In both cases you would have been **collecting data for a special purpose**.

### Asking the Right Question Is Important

Suppose you want to open a shoe store in your town. The first thing you need is information about the kinds of shoes the people in the town prefer. Hopefully, the data you collect will help make your store popular so that many people will shop there.

One way to gather data is to use a **survey**. A survey is made up of one or more questions that you ask people in order to find out information. Think about the kind of information you would need to know in order to make your shoe store successful.

#### What Questions Should You Ask in Your Survey?

Question like "Do you like shoes?" or "How many pairs of shoes do you own?" will **not** give you much information about what kind of shoes your store should sell.

Instead, ask questions such as the following:

- Do you prefer sneakers or leather dress shoes?
- Do you wear shoes with Velcro tabs or with laces?
- What kind of footwear other than sneakers do you wear? (Hiking boots? Slippers? Snow boots? Work boots?)

You could also ask questions about **shoe size**, **favourite colours**, or **cost**.



1.	Write three questions you would ask in order to gather data about the
	kinds of shoes you should sell.

	····	

Now, look back over your three questions. Ask yourself the following:

- Which question is more important than the others?
- Which question will tell me most about what I need to know?



- 2. Which one of your questions (from question 1)
  - is most important?
  - will give you the most information?

This question will be your survey question. Surveys sometimes ask many questions. However, the more questions you ask, the more difficult it is to organize the data you collect.



Check your answers in the Appendix.

### How Many People Will You Survey?

Now that you have decided on one question to use to collect your data, you need to decide which people you will survey.



**3.** Would it be possible to survey everyone in the town about what kind of shoes they like? Why or why not?



Usually only a certain number of people in the population take part in a survey. For example, in a town of 4000 people, only 100 people might be surveyed. In a class of 30, only 10 students might be surveyed. The answers of the people surveyed are used to show what the rest of the population likes.

The group of people surveyed is called a sample or a sample population.

# A sample is a small group that gives information about a larger group.

In one survey, people who ride the bus were asked if they were in favour of changing the bus route. Since it would be difficult to survey everyone who rides the bus, 10 people were surveyed at each of the 15 stops along the route.



#### Who to Ask

Which people would you survey about the kinds of shoes they wear? Would you choose

- 100 students at an elementary school?
- 100 senior citizens at a senior's lodge?
- 100 people in the phone book?

<u></u>					
	Chec	k your ans	swer in	the Appendix	

You should survey:

ask all kinds of people.

- people of different ages
- people of different ethnic origins
- people with different interests and hobbies

One way to do this might be to use the telephone book and **randomly** choose 100 names. For example, you might call every tenth name listed in the phone book and ask your survey question. A group of people chosen in this way is called a **random sample**.

5.	Think of one other way to choose 100 people in the town so that they are a random sample. Write your method here.			





How do you solve a problem that involves calculation?



Do you reach for your calculator? Do you use pencil and paper?

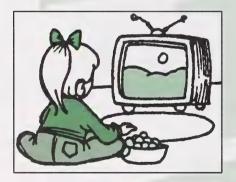


What happens when you're not in school or at home? What if you don't have a calculator or a pencil? Every day people are faced with computation problems that must be solved in their heads.

Have you ever used mental math to solve real-life problems like these?

You are in a store and see that candy bars cost 79¢ each. Can you calculate in your head the exact price of 8 candy bars?





The time is 8:17. You want to watch your favourite TV show at 9:00. How many minutes do you have to finish your homework?

You have \$28.00 in your bank account. You want to buy two leashes at the pet store. One leash costs \$12.95, the other costs \$15.99. Do you have enough money in your account?

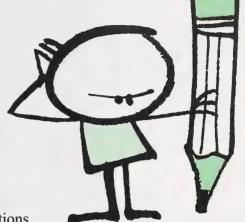


There are many everyday uses for mental math.

The more you work to improve your mental math skills, the more uses you will find for them.

Improving your mental math skills will also improve your estimating skills. Estimating is useful when you want to check to see if the answer you calculated is reasonable.

In Mathematics 4 you will learn to use several mental math strategies. You are probably used to using a calculator or pencil and paper to do difficult calculations.



Mental math helps make difficult calculations easy to do in your head.

It takes practice, but anyone can learn these skills! You'll be practising a few strategies later in this module.

Turn to Assignment Booklet 1A, and complete the activities for Day 3.



Day 4

### Collecting and Recording Data



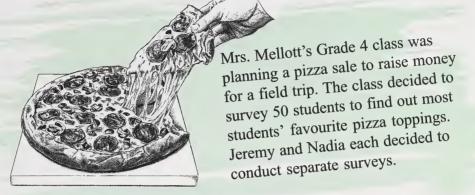
### Choosing a Sample Population

In Day 2 you saw that surveying 100 senior citizens about the shoes they like does not really tell you about **all** of the people in the town. Children, teenagers, and many adults would prefer different kinds of shoes than senior citizens.

To get a more accurate picture, you need to survey people of all ages.

Look at the following example. Decide whether the method used to collect data was a good one or not.

#### Example



- Jeremy surveyed 5 students from each of the 10 classes in the school. Based on the responses he got, he concluded that pepperoni and ham was the favourite topping for most students in the school.
- Nadia surveyed 25 students in Grade 1 and 25 students in Grade 2. Based on her survey results, she concluded that most students in the school prefer cheese topping.
- Was Nadia's method or Jeremy's method better for collecting data?
   Explain why you think so.





Remember: Before conducting a survey, it is important to think about the method you will use to collect the information.

- The **question** must be carefully worded so that you obtain the data you are looking for.
- The **sample population** being surveyed should give correct data about the larger population. A **random sample** is best.

### Keeping Track of the Data

As you gather data, you will need to keep track of it. You can record the information or data that you collect in two ways:

- Use a tally sheet.
- Use a response sheet.

#### Tally Sheets

A tally sheet is usually divided into three columns. The first column lists what you are looking for. Tally marks are used in the next column to record each time something is observed or a certain response is given. The tally marks are counted and the total is entered in the third column.

An example of a tally sheet follows. Students were asked how many windows their homes have. The Total column tells the number of times the answer 8, 9, 10, or 11 windows was given.



Tally marks are short, straight lines. Note that

HH means 5. Make 1

stroke for every person or item observed (up to 4) and then cross your strokes to show 5.

Number of Windows	Tally	Total
8	441	6
9	111	3
10	1111	4
11		1

#### **Response Sheets**

A response sheet usually has two columns. This type of recording sheet is used when many different kinds of responses are expected. In the second column, the response or data is written down instead of using tally marks.

An example of a response sheet is shown. In this survey, family members were asked what type of car they drive. Note that none of the responses are the same.

Person	Type of Car Driven
Dad	Buick Century
Aunt Nora	Volkswagen Beetle
Pierre	Chevrolet Camaro
Grandpa	Ford Escort
Marnie	Dodge Neon



- **2.** State whether you would use a tally sheet or a response sheet for each of the following surveys.
  - a. the type of birds visiting the bird feeders at school

- b. the number of birds visiting the bird feeders at school
- c. the kinds of vehicles going past your house in one day
- d. the number of vehicles going past your house in one day



Check your answers in the Appendix.





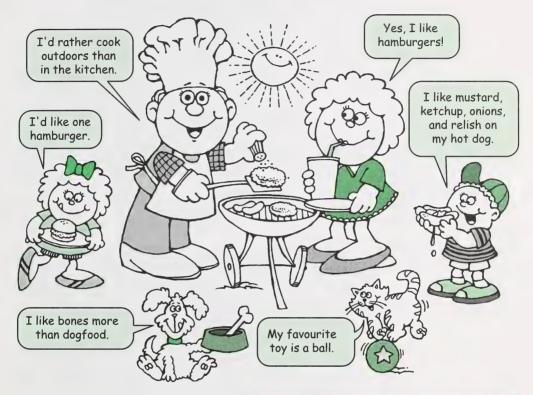
Sometimes just reading interesting facts about people, places, and things will help you make up your own surveys.

To learn interesting facts about people, sports, countries, natural disasters, history, science, and entertainment, visit the following website:

http://www.kids.infoplease.com

### **Recording Different Kinds of Data**

The kind of data you are collecting will help you decide how to record the information.



If you are asking a simple **yes** or **no** question, there are only two possible responses. A tally sheet should probably be used.

	ou ever bee	
	Yes	No
Alan	1	
Trina		1
Beth	1	
Nadia	1	
Eric		1

If you are looking for a number response, several answers are possible. A response sheet should probably be used.

Have many games do y	•
Alan	4
Trina	3
Beth	4
Nadia	8
Eric	11

If you are looking for a response that gives lots of information, the answers will likely all be very different. A response sheet should probably be used.

Wh	at do you do for fun?
Alan	play baseball, play hockey
Trina	talk on the phone, read books
Beth	play the piano, visit my friends
Nadia	go skating, watch TV
Eric	play computer games

A good way to survey people's favourite things is to give them just a few answers to choose from.

To do this, use a "Would you rather...?" question.

Would you rather ...



Here are some more examples:

- Would you rather
  - -read a book?
  - -watch TV?
  - -play a computer game?
- Would you rather
  - -go rollerblading?
  - −go biking?
  - -go swimming?
- Would you rather
  - -eat a pizza?
  - -eat a submarine sandwich?
  - -eat a hamburger?

3. Choose one of the "Would you rather...?" questions from the examples or make up one of your own. Write the three possible choices for your question in the chart.

Would you rather?	Prediction	Tally	Total

Try to find at least ten people to survey. Before you start, predict how many people you think will choose each response. Write these numbers in the **Prediction** column.

Now ask the people to answer your question. Keep track of their responses by putting tally marks in the **Tally** column.

Do your survey now. When you are finished, total the tally marks for each response and write the numbers in the **Total** column. Were your predictions close?



Check your answers in the Appendix.

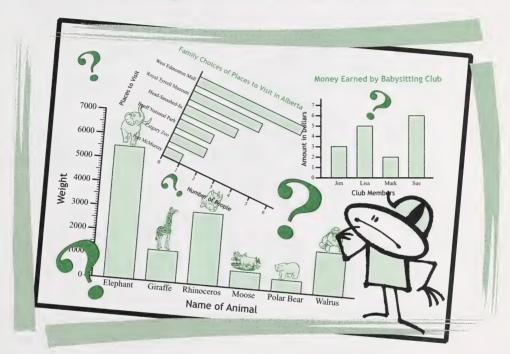
Turn to Assignment Booklet 1A, and complete the activities for Day 4.



### **Displaying Data**

In Day 4 you explored collecting and recording data. Today you will look at different ways to **display data**.

### Sharing the Data with Others

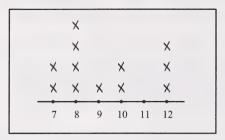


What do you do with the data after you have recorded it on a tally or response sheet?

Often the data is put into a graph or chart. This makes the information easy for other people to read and understand.

There are several types of graphs you can use to organize and present your information.

#### Line Plot



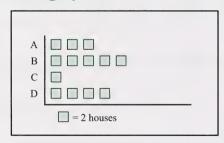
A line plot is a method of displaying number data by making marks above the numbers on a section of the number line.

#### Line Graph



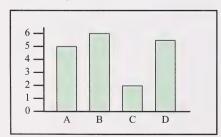
A line graph displays data by using points joined together by line segments.

#### Pictograph



A **pictograph** (or picture graph) displays data using symbols or pictures. Each symbol stands for a certain amount.

#### Bar Graph



A bar graph displays number data by using horizontal or vertical bars.



One of the most common types of graphs is the bar graph. Look carefully at the examples on pages 10 and 11 in the textbook to see the correct way to draw bar graphs. Most bar graphs have a vertical line on the left-hand side (the vertical axis) and a horizontal line across the bottom (the horizontal axis).

1. Look at the bar graph and answer the questions that follow.



- a. What is the title of this bar graph?
- **b.** What information is given along the vertical axis?
- c. How many club members are shown along the horizontal axis?

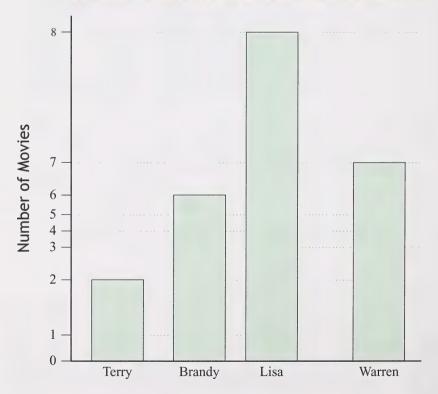


#### Remember these things when you draw a bar graph:

- A bar graph should contain
  - a title (usually at the top)
- a label along the horizontal axis
- a label along the vertical axis
- The numbers on an axis must be equally spaced along the line.
- The bars should all be the same width.
- The spaces between the bars should be equal.

Look at the following bar graph. See if you can find anything wrong with the way it is drawn.

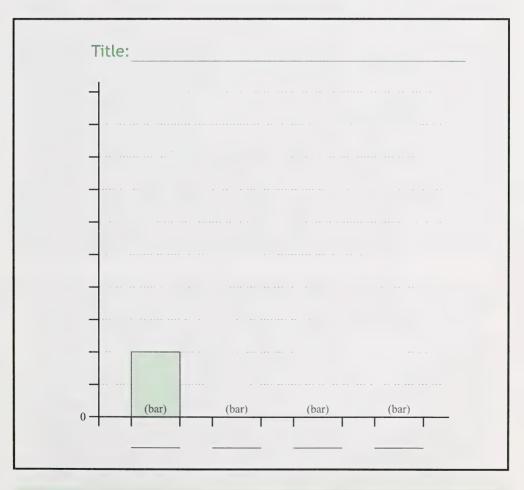
### Number of Movies Seen During the Summer



**Grade 4 Students** 

2.	What is wrong with the bar graph?

3. Redraw the graph from question 3 in the following space so that it displays the data correctly. Don't forget to label each axis, add a title, and colour the bars. The first bar is done for you.



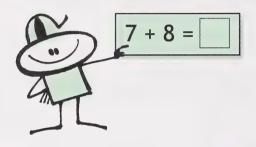


### **Basic Number Facts Practice**



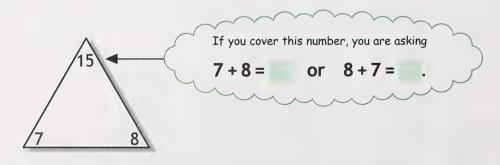
It's time to review the **addition** number facts. You probably know most of them already. For most students, regular review and practice is needed in order to master these facts. "Mastering the facts" means that you can give the answers instantly without counting or calculating.

After you complete the timed exercise in this activity, take time to look at the number facts that are giving you trouble. You will need to practise these facts more than the others.



One way to practise number facts is to make **flash cards**. There are a few different kinds you could try. One kind has the question part of the number fact on the front of the card and the answer part on the back.

Another kind is the triangular flash card. One part of the number fact is printed at each point of the triangle. By covering one part with your thumb or finger, you can create a number fact problem.



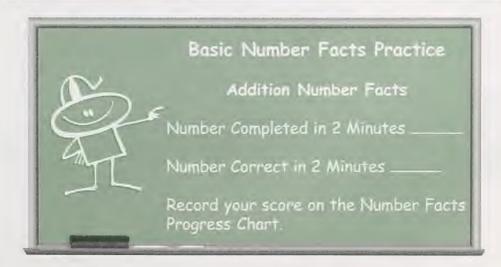
You can make your own flash cards from construction paper, manila tag, or poster board. If you have a lot of number facts to learn, only work on about ten at a time.

Be sure to keep track of your basic number facts drill scores as you work through each module. Use the Number Facts Progress Chart that is provided in the Appendix of each module. These charts will help you see how much you are improving. They will also tell you which kind of number facts (adding, subtracting, multiplying, or dividing) you need to practise most.



Turn to the Number Facts Progress Chart for Module 1 in the Appendix. Remove the chart from the Appendix and hang it in your study area. You will use this chart to record your scores for the number facts drills in Module 1.

Ask your home instructor to time you as you complete the following exercise. Your goal is to complete all 25 questions in 2 minutes. At the end of 2 minutes, count up how many questions you were able to complete. Write this number in the chart below. Then use the answer key in the Appendix to mark the exercise, and record your score in the space provided. Before you move on, go back and complete any questions you did not finish during the 2 minutes. Mark these questions using the answer key as well.



4. Addition Number Facts **Timed Exercise: 2 minutes** 

$$4 + 9 =$$

$$4+9=$$
  $9+6=$   $8+7=$   $6+5=$ 

$$8 + 7 =$$

$$6 + 5 =$$

$$9 + 9 =$$

$$7 + 4 =$$

$$7+4=$$
  $6+9=$   $6+8=$   $9+5=$ 

$$6 + 8 =$$

$$9 + 5 =$$

$$8 + 8 =$$



Check your answers in the Appendix.

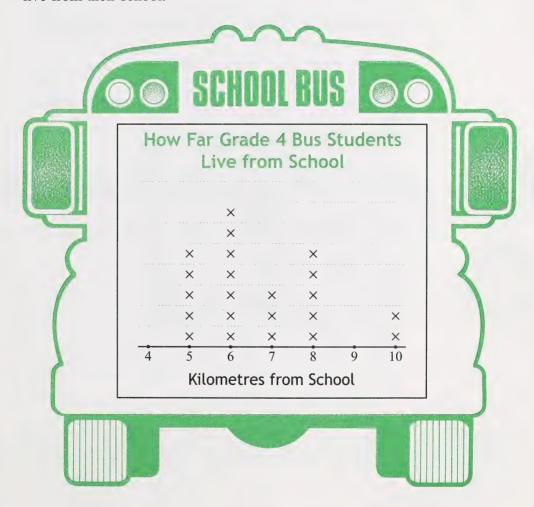
Turn to Assignment Booklet 1A, and complete the activities for Day 5.



### **Interpreting Line Plots**

In Day 5 you learned that data can be displayed using a **line plot**. Line plots are an easy way to present data using a number line. The data is displayed by making crosses or large dots above numbers in the number line.

Here is an example of a line plot that shows how far Grade 4 bus students live from their school.



1.	You can tell many things by studying a line plot. Answer these questions about the line plot showing how far bus students live from school.				
	a. How many students live 8 km from school?				
	<b>b.</b> How far does the largest group of students live from school?				
	c. What is the greatest distance students live from school?				
	d. How many Grade 4 students ride the bus?				
	e. Over half of the students live 7 km or more from school.				
	True or False (Circle one.)				
	Check your answers in the Appendix.				
2.	Turn to page 16 of your textbook. Do question 1 of On Your Own.				
	On Your Own, Question 1				
	Based on the data, these three statements are true:				
	•				
	•				
	•				

What can you conclude about the jumpers? (Begin your sentence with
"Most Grade 4 students")
,





Check your answers in the Appendix.



**3. a.** Turn to page 16 of your textbook. Look at the line plot in the Practise Your Skills box.

Write **five** questions about the line plot on page 16. Ask someone in your family to answer the questions.

Question	Answer

**b.** Do question 2 of Practise Your Skills.

Practise Your Skills, Question 2

My title for the line plot is \_\_\_\_\_\_.



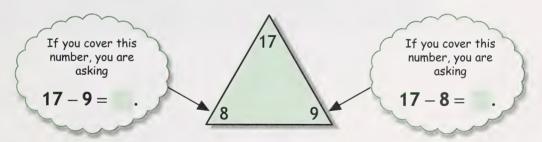
## **Basic Number Facts Practice**



Today you will review the **subtraction** number facts. Remember that your goal is to master all of the addition and subtraction facts up to 18. This means that you should know them so well that you can recall them instantly without counting or calculating.

Just as you did with the addition number facts, you should spend time practising the subtraction number facts that give you trouble. One way to practise is by using flash cards. You can use regular flash cards with the question on the front of the card and the answer on the back.

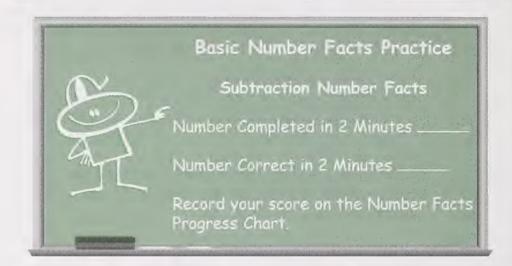
Or, you can use the same triangular flash cards you made for practising the addition number facts. By covering different numbers, you can create different questions.



Practise with the flash cards often. Limit how many number facts you practise to about ten at a time. When you feel you know those ten facts well, go on to another set of ten.



Ask your home instructor to time you as you complete the following exercise. Your goal is to complete all 25 questions in 2 minutes. At the end of 2 minutes, count up how many questions you were able to complete. Write this number in the chart below. Then use the answer key in the Appendix to mark the exercise, and record your score in the space provided. Before you move on, go back and complete any questions you did not finish during the 2 minutes. Mark these questions using the answer key as well.



4. Subtraction Number Facts **Timed Exercise: 2 minutes** 

$$13 - 5 =$$

$$17 - 8 =$$

$$14-6=$$
  $13-5=$   $17-8=$   $15-7=$   $14-8=$ 

$$14 - 8 =$$

$$17 - 9 =$$

$$16 - 7 =$$

$$17-9 = 16-7 = 13-4 = 12-7 = 15-6 =$$

$$12 - 7 =$$

$$15 - 6 =$$



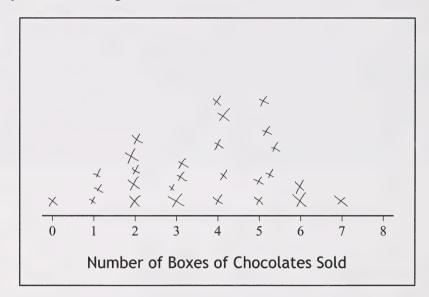


### Taking Another Look

The following activity is optional. You may choose to do it or not. You **should** complete the activity if you had difficulty with the questions in Day 6, or if you feel you just need more practice with interpreting a line plot.

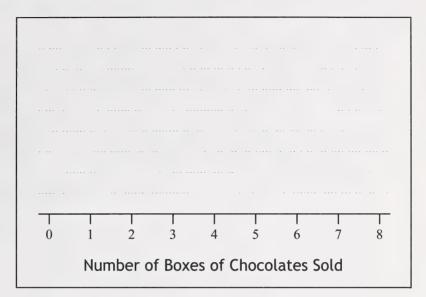
If you choose **not** to do the questions at this time, you may wish to return here later to review the concepts on line plots before completing the review activities for Day 16.

Look at the following line plot. It shows the number of boxes of chocolates sold by students during a Grade 4 fundraiser.



1. What is wrong with the way this line plot is drawn?

2. Redraw the line plot correctly.



- **3.** Use the line plot you drew for question 2 to answer the following questions.
  - a. The largest group of students sold how many boxes of chocolates each? \_\_\_\_\_
  - **b.** How many students sold four or more boxes of chocolates?
  - **c.** Why is the number zero included on the line plot?
  - **d.** How many students are in the class?

How many students are in the class?

Check your answers in the Appendix.



Turn to Assignment Booklet 1A, and complete the activities for Day 6.



### Interpreting Bar Graphs and Pictographs

In Day 6 you looked at line plots as a way of displaying data when one axis (usually the horizontal axis) is made of a section of the number line.

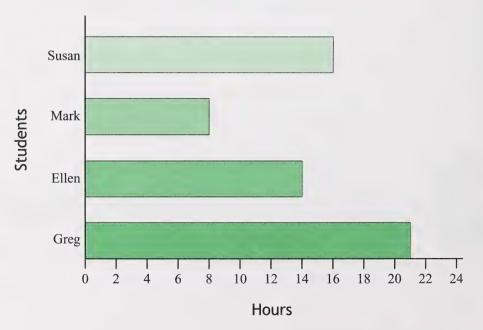
Today you are going to examine **bar graphs** and **pictographs** to see how they can be used to show data.



### Interpreting a Bar Graph

Here is an example of a **horizontal** bar graph showing the number of hours some Grade 4 students spent watching TV in one week.

# Time Spent by Some Grade 4s Watching TV in One Week



By studying the data shown in the bar graph, you can discover many things about these Grade 4 students. For example, the data shows that Susan watched 16 hours of TV and Mark watched 8 hours of TV. Therefore, you could write the following true statement:

#### Susan watched twice as many hours of TV as Mark did.

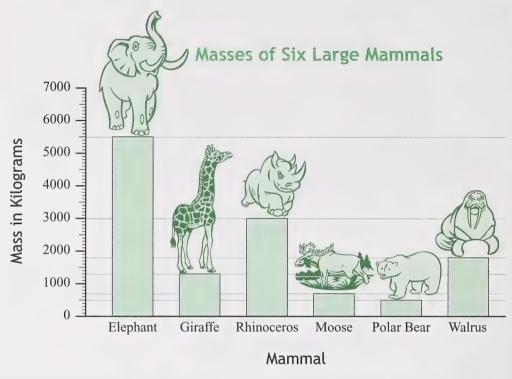
1. Write **four** more true statements about the data displayed in the bar graph. (Tell who watched the most, the least, or more or less than someone else; how many hours were watched by each person; and so on.)

	,			and the second s
Annual Province And Annual Province Annual Pro		 	·	





2. This is an example of a **vertical** bar graph. Look carefully at the graph to see how the data is displayed and to see what conclusions you can make based on the data.



- a. Which animal has the greatest mass?
- **b.** Which animal has a mass of about 3000 kg?
- **c.** Which three animals have a total mass equal to the mass of the elephant?

-----,

d. How much more is the mass of the rhinoceros than the polar bear?





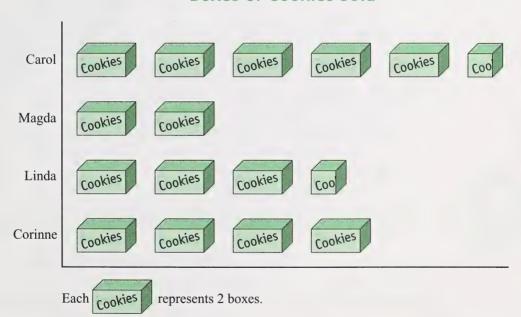
If you are interested in finding out more about mammals or other living creatures, check out Yahooligans.com.

http://www.yahooligans.com/Science\_and\_Nature/Living\_Things/Animals/Mammals/

# Interpreting a Pictograph

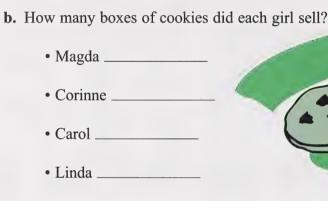
Look at the following graph. This graph is called a **pictograph**. Pictures or symbols are used to display the data. Each symbol on a pictograph stands for one or more than one piece of data. In this pictograph, each symbol stands for two boxes of cookies. Note that sometimes only half of the symbol appears on the graph. Half of the symbol stands for half as many boxes of cookies (one box).

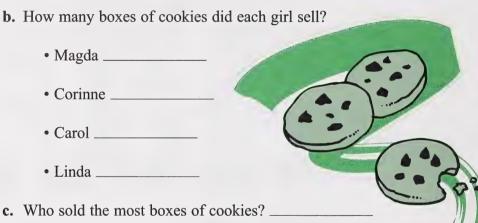
## **Boxes of Cookies Sold**

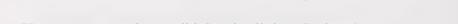


Did you also notice that all of the symbols are drawn carefully so that they are all the same size? The symbols are also carefully placed so that they line up one below the other. This is important so that you can compare the number of symbols in each line.

- 3. Answer the following questions using the information shown in the pictograph.
  - a. How many boxes of cookies does half of the symbol stand for?

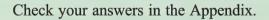






**d.** How many boxes of cookies were sold altogether?

e. How many more boxes did Carol sell than Corinne?

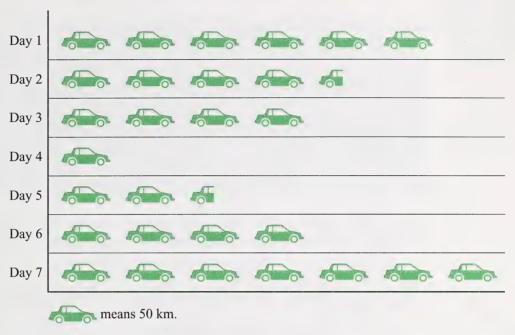


The students in a Grade 4 class were asked to share something about their summer vacation. Andrew decided to present information about the distance his family travelled each day during their car trip to British Columbia.

Following is the pictograph Andrew constructed.



## BC Trip—Distance Driven Each Day



- 4. Use the information in the pictograph to answer the following questions.
  - a. On what day did Andrew's family drive the farthest?
  - **b.** How many kilometres does half a symbol stand for?
  - c. How far did Andrew's family travel on Day 2?
  - d. How much farther did they travel on Day 1 than on Day 5?
  - e. On which two days did they travel the same distance?
  - **f.** How far did the family travel altogether?



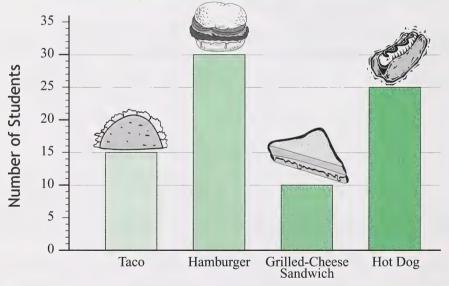
## Taking Another Look

The following activities are optional. You may choose to do them or not. You **should** complete the activities if you had difficulty with the questions in Day 6, or if you feel you just need more practice with interpreting bar graphs or pictographs.

If you choose **not** to do the questions at this time, you may wish to return here later to review the concepts on bar graphs and pictographs before completing the review activities for Day 16.

1. The school cafeteria at Poplar Grove Elementary decided to survey a sample of students to see which lunch specials were most popular. The survey results were displayed using a bar graph.





## Lunch Special

a. Which one of the four specials did the students prefer most?

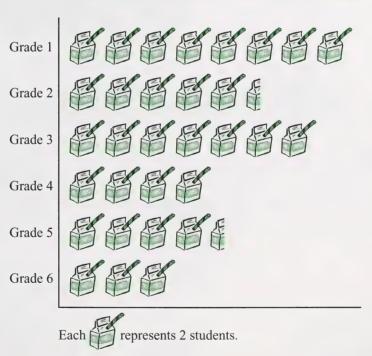
- **b.** How many students prefer tacos?
- c. How many more students would rather have a hamburger than a grilled-cheese sandwich?
- **d.** How many students were surveyed?



Check your answers in the Appendix.

2. Look at the pictograph and then answer the questions that follow.

# Number of Students Who Bought Milk in the School Lunchroom on Friday



- **a.** How many students in Grade 5 bought milk?
- **b.** How many more Grade 1 students than Grade 6 students bought milk?

c.	How many	students in a	ll bought milk th	nat Friday?	
----	----------	---------------	-------------------	-------------	--

**d.** Which grade bought the most milk?

**e.** Grade 3 students drank as much milk as which other two grades combined?

\_\_\_\_\_ and \_\_\_\_





Check your answers in the Appendix.

Turn to Assignment Booklet 1A, and complete the activities for Day 7.



# **Problem Solving**

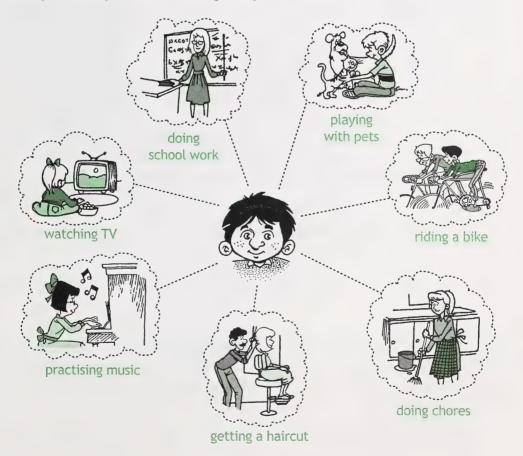


Ask your home instructor to sit with you as you read through the following pages. Together you can discuss your ideas about problem solving and any questions you may have about the ideas presented here.

# Introduction to Problem Solving

Did you know that you are already a problem solver? You have probably solved many problems today. Some problems may have had simple solutions. Others may have had solutions that needed a lot of work.

Did you do any of the following today?



Every time you were doing a task, you were problem solving. For example, you may have solved some of these problems if you were playing with your pet:

- Does my pet need exercise?
- Does my pet need grooming?
- Is my pet hungry?
- What game should I play with my pet?

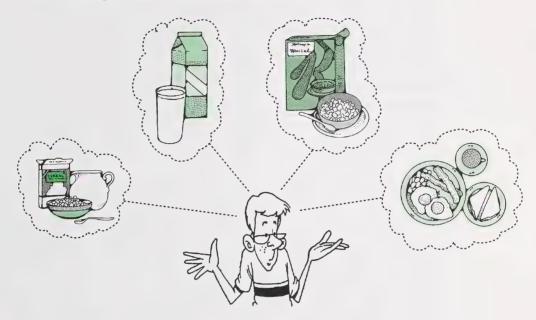


Each of these problems has many solutions. You probably found a solution without even knowing that you were solving a problem. Did you have to find a leash, a brush, or a ball? Did you have to play indoors because of rain? Did you have to find the pet food? If so, you were being a problem solver.

Problems can be solved in many ways. Today you will be looking at the four-step method of problem solving. You can use this method to help solve your everyday problems as well as math problems in Mathematics 4.

## The Problem-Solving Process

Suppose you wake up one morning and find there is no milk for your cereal. You have a problem. How could you solve it?



- Could you eat your cereal without milk?
- Could you eat something else instead of cereal?
- Could you try something else like juice or water on your cereal?
- 1. Think of at least three more ways you could solve this problem.

•		
_		
•	 	 



Thinking about different ways to solve a problem is part of the problem-solving process. The next step is to choose what you think would be the best way to solve it. Some people might choose to skip breakfast, others would eat a bigger lunch, and others might make a note to buy milk later in the day. Other people might choose to immediately head off to the store and buy milk, return home, and eat their breakfast of milk and cereal. Perhaps you have another solution.



**2.** Which of the solutions do you think is best? Explain why.



## Check your answer in the Appendix.

After you have decided on a plan of action, the next step is to carry it out. Hopefully, your plan will solve the problem of no milk for breakfast.

Finally, you need to look back and ask yourself some questions:

- Did my plan solve the problem?
- Did it create other problems that now need to be solved?
- Was it a good way to solve the problem?
- Was there a better way I could have tried?

For example, if you chose to go to the store, and because of this you were late for school, then perhaps this wasn't the best solution. Looking back helps you decide if your solution was a good one or if a new solution needs to be tried immediately or in the future.



If you chose to eat your cereal dry, and you found that after two mouthfuls you couldn't eat any more, you might immediately switch to another solution such as trying water or juice on your cereal. Or, if you ran out of milk again the following week, you probably wouldn't try eating your cereal dry again because it wasn't a good strategy the first time you tried it.

As you can see, there is often more to solving a problem than just finding or calculating a number answer.

## The Four-Step Method

The problem-solving process can also be thought of as the four-step method. This method is outlined in the following chart, and is explained in greater detail at the beginning of the module in the section called Information for the Student.

No matter which strategy you use to solve a problem, the four-step method will help you solve it in an organized way.

## Using the Four-Step Method

Problems can be solved in a variety of ways. No one method of solving a problem will work for every problem. However, the four-step method is a useful way to approach any problem that needs solving.

## Step 1: Understand the problem.

Ask yourself, "What is the problem about? What is it asking me to find?"

## Step 2: Make a plan. (Choose a strategy.)

Think of several strategies that you could try.

## Step 3: Try the plan.

Use one or more of the strategies to solve the problem.

## Step 4: Look back.

Evaluate the solution: Think and talk about your solution. (Ask, "Is it reasonable? Does it solve the problem?")

Evaluate the strategy. (Ask, "Was there a better way, a faster way, or an easier way to solve this problem?")

## **Problem-Solving Strategies**

Throughout the Mathematics 4 course, you will be introduced to several strategies that can be used to solve problems. Remember that no one strategy works for all problems. To become a good problem solver, you need to try different strategies for different problems. If one strategy doesn't work, try a different one.

Many students fall into the trap of trying only one strategy to solve a problem. If that strategy doesn't work, they give up because they think the problem is too hard. Instead, they should try to think of another strategy that could be used to solve the problem.



As you learn more about using problem-solving strategies, you might be surprised to find that you already know and use some of these strategies when you solve everyday problems.



Remember: A problem can usually be solved several different ways. Your strategy for solving a problem may be completely different from the way your friend or your home instructor solves a problem. Therefore, it is important and helpful to discuss and compare your strategies with your home instructor. Sometimes you will even be asked to try solving the same problem a second time by using a different strategy than you used the first time. Doing this will help you to develop the skills needed to become an effective problem solver.

Descriptions of the seven problem-solving strategies introduced in Mathematics 4 can be found in the Problem-Solving Strategies section of the Appendix in this module. You may refer to this section at any time throughout the year if you need help using a certain strategy.

Now you will look at one strategy that is useful in solving certain problems.

# Problem-Solving Strategy: Acting Out the Problem

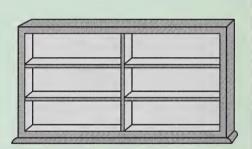


Have you ever tried to solve a problem, but found it too confusing because you couldn't get a picture of it in your mind? If so, you might want to find out more about the strategy called Acting Out the Problem.

This strategy helps you find a solution by getting you involved in doing the action described in the problem. Often this means using or moving an object with your hands. You might make or draw something to use, or use manipulatives you already have.

Use the Acting Out the Problem strategy to help you solve the following problem.

Reena has 6 stuffed animals in the display case in her room: a tiger, an elephant, a bear, a giraffe, a lion, and a dog. The case has 3 shelves with 2 spaces on each shelf. Reena put the animals in the following positions:



- The bear is next to the lion and above the dog.
- The giraffe is **not** next to the lion or the dog.
- The tiger is **not** next to the giraffe.

Where did she put each of the stuffed animals?

Remember that the problem-solving process uses a four-step method.

Step 1: Understand the problem.

3. What question do you have to answer?

Step 2: Make a plan. (Choose a strategy.)

Try the Acting Out the Problem strategy.

Step 3: Try the plan.

In this case, your "acting" will be moving the stuffed animals around on the shelves of the display case. You'll be using pieces of paper with the names of the animals printed on them.



Turn to the Cut-Out Learning Aids section in the Appendix. Remove the page called Day 8: Stuffed Animals and Display Case. Cut out the six stuffed animal cards and the display case. Put the drawing of the display case on the table in front of you.

Now go back to the problem to find out what you know about the stuffed animals. Use the information to put each animal card on the correct shelf.

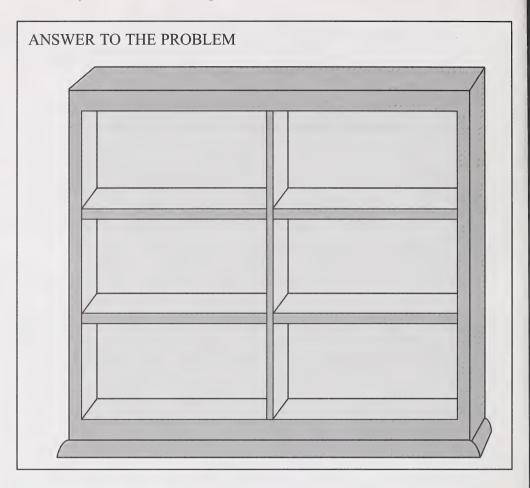
- **4. a.** You know that Reena put the bear next to the lion and above the dog. Knowing this, where could you put the bear card?
  - b. Where will the lion go?
  - c. Where will the dog go?



## Check your answers in the Appendix.

Continue to put the animal cards on the display case using the information given in the problem. Remember to keep checking back to the problem. If you can't put an animal on a shelf because the placement doesn't agree with what the problem says, STOP. Remove the cards and start again. (**Hint:** Start again by placing the bear card on a different shelf.) Keep moving the cards around until you have solved the problem correctly.

## 5. Show your solution to the problem here.



Step 4: Look back.

This is the time when you read the problem again to see if you have really answered the question. Does your answer tell where Reena put each of the stuffed animals?

In order to tell whether your answer is reasonable, check each of your answers with the information given in the question. Do this now.

Before you check your answers in the Appendix, ask yourself, "Is there another way to arrange the animals using the same information?" Try the problem again and see.

**6.** Did you find another way to arrange the animals? Explain.



## Check your answers in the Appendix.

Problem solving is not used only in mathematics. It is also used when solving problems every day. Your problem-solving skills are developed by

- learning new strategies
- sharing and comparing your strategies with others
- thinking about ways to use the strategies in new situations

Sometimes, you may think a problem can't be solved because none of the strategies you tried seemed to work. If so, you may have to invent your own strategy. When you do this, take time to look back and see what you did and why. This is important so that you can use the strategy again to solve other problems.

Turn to Assignment Booklet 1A, and complete the activities for Day 8





For more practice with problem solving, visit these websites:

• Finch Math Problems of the Week

http://www.mbnet.mb.ca/~jfinch/math.html

Math Word Problems for Children

http://www.mathstories.com

# Assessing What You Know (I)

Today is the last day you will be working on Section 1: Dealing with Data. You are to complete three activities in Assignment Booklet 1A.

- Showing What you Can Do
- Project Time
- Basic Number Facts

Read the explanation of the activities in Parts 1, 2, and 3 before turning to Assignment Booklet 1A. Note that you will need the help of your home instructor for the activities in Part 1 and Part 3.



# Part 1: Showing What You Can Do



For this activity you will need the help of your home instructor. You will be working on a short activity while your home instructor observes you. As you work through the problem, try to explain clearly what you are doing.

Your home instructor may ask you questions like the following:

- "How do you know that?"
- "Why did you decide to do that?"
- "How did you get that answer?"

Your job is to explain what you are doing so that your home instructor can understand your thinking.



#### **Note to the Home Instructor**

This performance assessment should take about 20 minutes. The Home Instructor's Assessment Page and accompanying Student's Assessment Page can be found in Day 9 of Assignment Booklet 1A. Remove both pages from the Assignment Booklet. Read over the student's page so you are familiar with the student's assigned task. You should also preview the interview questions and the checklist before the student begins work on the assigned task.

As the student works to answer the questions, encourage him or her to talk about what he or she is doing. Allow the student to use any manipulatives or cut-out learning aids available to help solve the problem. You may or may not wish to use some of the interview questions. Look for understanding and the student's ability to explain clearly what he or she is doing to arrive at an answer. Indicate on the checklist whether you feel the student demonstrated the skills being assessed.

Attach both assessment pages to the Assignment Booklet before sending it in for marking.

# Part 2: Project Time

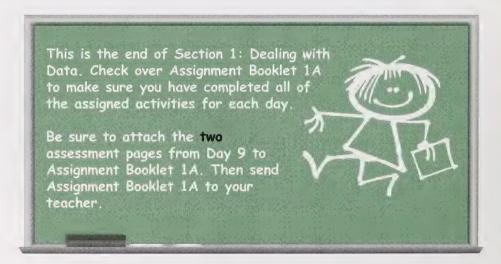
Now it's time for you to use what you know about data collection, data recording, and data display to carry out a data management project. If you need to, look back through Days 1 to 7 to help you with this project. You may not be able to complete the project in one day since it involves collecting data from several people. If necessary, keep working on your project as you move on to Day 10 and Day 11.

## Part 3: Basic Number Facts

In this activity you will show how well you are doing at learning your basic number facts for addition and subtraction. Ask your home instructor to time you as you do each test.

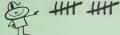
When your home instructor is ready, turn to Assignment Booklet 1A, and complete the activities found in Parts 1, 2, and 3 of Day 9.





# Section 2 From Data to Graph





# **Constructing Pictographs**

It is much easier to read and interpret data displayed in a graph than it is to read and interpret data displayed as a long list of numbers, letters, or words. Pictographs, line plots, and bar graphs are all useful tools for displaying data so that it can be easily understood.

# One-to-One Correspondence

The easiest pictographs to construct are those where one symbol stands for one item of data. For example, to complete the following pictograph of favourite fruits, you are to let one symbol stand for **one** person. This is called one-to-one correspondence.

## **Favourite Fruits**

In a survey of one Grade 4 class, students were asked which of these four fruits is their favourite. 8 **Apple** Banana Strawberry Orange A tally was kept of their answers. **Favourite Fruit Number of Students** Total **Apple** 44-111 Orange 111 Banana 1111 441 Strawberry



1. Complete the tally sheet by filling in the totals in the third column.

Check your answers in the Appendix.

**2.** Use the information on the tally sheet to construct a pictograph to show how many students prefer each fruit. Use **one-to-one correspondence**.

Let each stand for one student.

Title:	
Apple	
Orange	
Banana	
Strawberry	
=	





## Remember:

- Make all the symbols the same size.
- Keep the symbols lined up one below the other.
- Write a title at the top of the pictograph.
- Complete the statement at the bottom of the graph.

## **Bird-Watching**

Bonnie enjoys bird-watching on her parents' farm in central Alberta. She is interested in five different kinds of birds found in her area. Bonnie records the number of times she sees each kind of bird. Over a one-week period in June, she completed the following tally sheet.



Type of Bird	Number of Times Seen	Total
American Goldfinch	HH 11	
House Wren	11	
Black-Capped Chickadee	441	
Yellow Warbler	1	
White-Throated Sparrow	111	

**3.** Fill in the **Total** column in Bonnie's tally sheet by totalling the number of tally marks for each type of bird.



**4.** Construct a pictograph using one-to-one correspondence. Use the information from Bonnie's tally sheet to display how many of each kind of bird she saw. Choose a simple symbol to use for your pictograph. It should be one that you can draw easily many times. You may want to use a symbol like this:





## Remember:

- Make all the symbols the same size.
- Keep the symbols lined up one below the other.
- Write a title at the top of the pictograph.
- Complete the statement at the bottom of the graph.

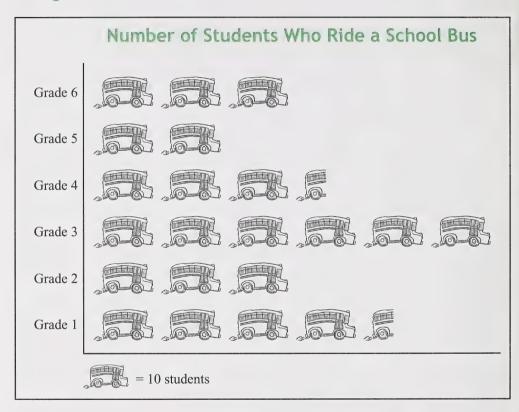
	Title:	
*\$	<i>&gt;</i> =	



# Many-to-One Correspondence

When working with pictographs in Day 6, you saw that it is not always necessary to draw a symbol or picture for each item of data. For example, in the following pictograph, each time the bus symbol is used, it stands for ten students. This is called **many-to-one correspondence**.

## Riding the Bus



- 5. How many students does half of a bus stand for?
- 6. How many students in Grade 5 ride a school bus?
- 7. How many students in Grade 1 ride a school bus?

8.	Think of one reason why you would not want to use one-to-one correspondence in the graph.			



## Check your answers in the Appendix.

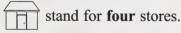
You can see that many-to-one correspondence is a useful way to display data so that it is easier to read and interpret the information. It also makes the graph simpler for you to construct.

## Stores in Brookville

Ralf made a chart of the number and the different kinds of stores in his town.

N	Number of Different Kinds of Stores in Brookville						
Type of Store	Toy	Drugstores	Clothing	Jewelry	Grocery	Hardware	Others
Number of Stores	10	8	12	2	14	4	6

**9.** On the following page, draw a pictograph to display the information in the chart. Use **many-to-one correspondence** by making the symbol





#### Remember:

- Draw all of the symbols the same size.
- Each symbol should line up with the symbol above or below it.
- Write a title at the top of the pictograph.
- Complete the statement at the bottom of the graph.

Title:

Type of Store	Number of Stores
Тоу	
Drugstores	
Clothing	
Jewelry	
Grocery	
Hardware	
Others	
= 4	stores



Check your answers in the Appendix.

Turn to Assignment Booklet 1B, and complete the activities for Day 10.



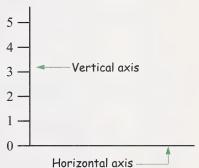
# Constructing Bar Graphs (I)

In Day 7 you saw how data can be displayed using a bar graph. You also wrote some conclusions based on data shown in a graph. Today you will learn more about constructing bar graphs.

# One-to-One Correspondence

When you made pictographs using one-to-one correspondence, each symbol stood for **one** unit or **one** item of data.

When a bar graph uses one-to-one correspondence, the numbers along the vertical axis increase by **one** as you move upwards. This means the space between the ticks stands for **one unit** (one person, one book, one centimetre). The numbers count up by **ones** beginning at zero.



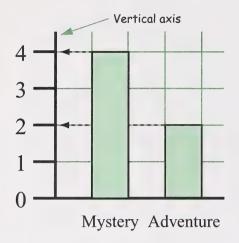
In the following exercise you will make a bar graph to show the types of books in Pierre's library. You will use one-to-one correspondence.

## Pierre's Library

Pierre decided to organize the books in his home library. He used a tally sheet to put the books into categories or groups. Then he counted the number of books in each group. Here is the chart Pierre made as he collected his data.

Animal Stories	Science Fiction	Adventure	Biography	Poetry	Mystery
1111	111	## ##	##	##	##* ##*

Work through the following steps. You will be constructing a vertical bar graph using data from the chart.



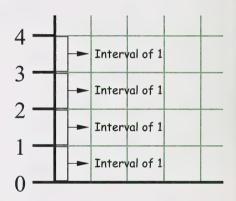
## Step 1: The Vertical Axis

The vertical axis will show the **number** of each kind of book in Pierre's library.

When your graph is finished, just compare the height of each bar with the numbers along the vertical axis.

When you make your graph, use evenly-spaced ticks for the numbers along the vertical axis.

The space between ticks is called an **interval**. When using one-to-one correspondence, the interval is always 1 or **one unit**.



How many ticks will you need? (How tall will you make your graph?)

Before you begin your graph, look at the largest number in your data. As you are making your graph, keep in mind that the top tick should be a number that is a little bit bigger than the largest number in your data.

1. a. Find the number of books in each group on the tally sheet. To do to count the tally marks.							
Anima	al Stories	Biography					
Science	ee Fiction	Poetry					
Adven	iture	Mystery					
<b>b.</b> Which	number in the data is the large	st?	_				
2. What num axis?	nber would be a good choice fo	r the top tick o	n the vertical				
	Check your answers in t	he Appendix.					
There you w	11 of the Cut-Out Learning Aid ill find a graph form for construrre's library. Remove the page f	cting your bar	graph about the				
3. On the gr	raph form, do the following:						
	• Place a tick at the bottom of the vertical axis.  Beside the tick write a zero (0).						
• Place ticks along the axis from bottom to top.  Continue to number the ticks as you move up the							
axis (0, 1, 2, 3,). Stop when you reach a number that is a little bigger than the largest							
	ber of books.	c largest	0				
4. How large	e is each interval along the vert	ical axis?					



## Step 2: The Horizontal Axis

You are constructing a vertical bar graph. This means the bars will run up and down. All of the bars will start at the horizontal axis, which is the line along the bottom of the graph. One bar is needed for each type of book.

**5.** How many bars will be needed on your graph to show all types of books in Pierre's library? \_\_\_\_\_

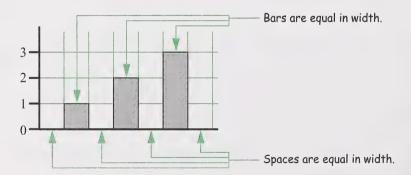


Check your answer in the Appendix.

Once you know how many bars you need, you must decide where to draw each of them. Notice the grid on your graph form. The grid is the pattern of light squares. Use the grid to help you space the bars evenly.

## Remember these rules:

- All bars should be of equal width.
- All the spaces between the bars should be of equal width.



Find the horizontal axis on your graph form. Because there are six types of books in Pierre's library, you will need to show six bars with spaces in between.

**6.** Put ticks along the horizontal axis to show where each of the six bars will begin. Use the grid to help you. Allow one grid square for each space and one grid square for each bar. Begin with a space.

Check your answers in the Appendix.

Now that you have marked the ticks to show how wide to make the bars and spaces, it is time to draw the bars. Use a ruler to make sure the sides of the bars are straight.

7. On your graph form draw the bars to show how many of each type of book Pierre owns. Use the numbers along the vertical axis to help you decide how tall to make each bar.

Next, colour your graph. Use felt markers or crayons to carefully colour each bar.









## Step 3: Labels and Titles

Labels and titles must be added so that anyone reading the graph can tell what information is being presented.

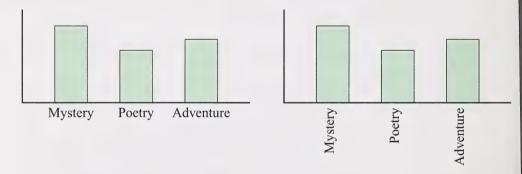
## To complete your bar graph

- the bars must be labelled
- the two axes must be labelled
- the graph must be given a title

## Labelling the Bars

Labels for the bars are usually written below each bar. For your bar graph, each bar should be labelled with one type of book found in Pierre's library.

Here are two ways to label the bars.



**8.** On your graph form, label each bar by writing a type of book below each bar. Because the six bars are narrow, you may wish to turn your paper sideways to write each label.



## Labelling the Axes

Both the horizontal axis and the vertical axis must be labelled. Each label should explain what information is being shown on the axis.

For example, the horizontal axis shows the different types of books in Pierre's library. Therefore, a suitable label would be **Types of Books**.

- **9. a.** The vertical axis tells how many books of each type there are. Therefore, a suitable label would be
  - **b.** On your graph, write a label for each axis.



## Writing a Title

A title is usually written at the top of every graph to tell what information the graph is showing.

- 10. a. Write a suitable title.
  - **b.** Write this title at the top of your graph.

Check your answers in the Appendix.

Constructing bar graphs using one-to-one correspondence is easy to do and is a useful way to display data when the numbers are small. For data with larger numbers, bar graphs using many-to-one correspondence are more useful.





# **Basic Number Facts Practice**



Earlier in the module, you reviewed the addition and subtraction facts from Grade 3.

Are there still some number facts that you need to work on? Your goal is to master all of the addition and subtraction facts up to 18.

"Mastering the facts" means being able to give the answer quickly without counting or calculating.

A good way to learn the facts is to make your own set of flash cards. Make cards for the facts that you don't know and the facts that you only "sort of know."

Practise with the flash cards often (several times a day if possible). Each time you practise, separate the cards into two piles:

Facts I Now Know Facts I Need to Learn

## Get to Know the Number Fact Families

Some students learn the number facts by practising them in groups or families. Did you know that each addition fact and each subtraction fact belongs to a family of two or four number facts made from the same numbers?



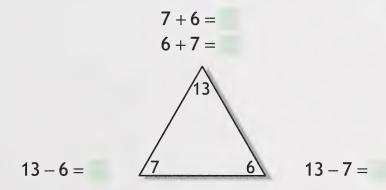
For example, 6+7=13 belongs to a family of four facts:

$$6 + 7 = 13$$
  
 $7 + 6 = 13$   
 $13 - 7 = 6$   
 $13 - 6 = 7$ 

8+8=16 belongs to a family of two facts:

$$8 + 8 = 16$$
  
 $16 - 8 = 8$ 

If you use triangular flash cards, you can easily see how the three numbers in each number fact are related through addition and subtraction.



Just like members of a family are related, these four facts are related. They are called related number sentences or related sentences.

11. Write the four related sentences for each pair of numbers.
--

a.

9 + 4

b.

8 + 7

C

6 + 8



Check your answers in the Appendix.

Try using this method to learn the number facts that are giving you trouble. Remember that some number fact families have only two related sentences.

### Example

9+9

9 + 9 = 18

18 - 9 = 9

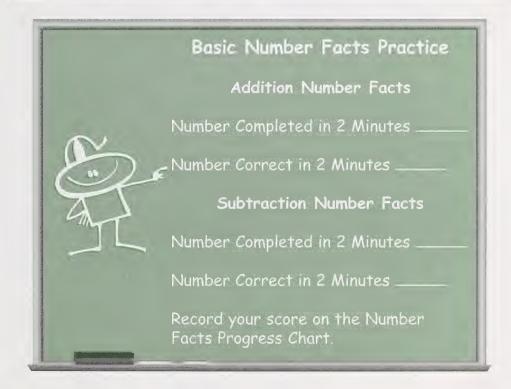
**12.** Explain why some number families or groups have four related sentences and some have only two.



Check your answers in the Appendix.



Ask your home instructor to time you as you complete the following exercises. Your goal is to complete all 25 questions in each exercise in 2 minutes. At the end of 2 minutes, count up how many questions you were able to complete. Write this number in the chart below. Then use the answer key in the Appendix to mark the exercise, and record your score in the space provided. Before you move on, go back and complete any questions you did not finish during the 2 minutes. Mark these questions using the answer key as well.



### 13. Addition Number Facts **Timed Exercise: 2 minutes**

$$8+8=$$
  $5+9=$   $6+7=$   $4+8=$ 

$$5 + 9 =$$

$$6 + 7 =$$

$$6 + 9 =$$

$$9 + 7 =$$

$$6 + 8 =$$

$$6+8=$$
  $8+7=$   $5+6=$ 

$$9 + 6 =$$



Check your answers in the Appendix.

14. Subtraction Number Facts **Timed Exercise: 2 minutes** 

$$17 - 8 =$$

$$12 - 4 =$$

$$17-8 = 12-4 = 16-8 = 15-9 = 14-7 =$$

$$14 - 7 =$$

$$15 - 6 =$$

$$13 - 4 =$$

$$15-6 = 13-4 = 14-5 = 16-7 = 17-9 =$$

$$16 - 7 =$$

$$17 - 9 =$$



Check your answers in the Appendix.

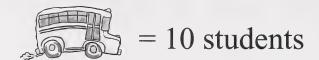
Turn to Assignment Booklet 1B, and complete the activities for Day 11.



# Constructing Bar Graphs (II)

### Many-to-One Correspondence

Remember that when data is displayed using a pictograph, it is often easier to use many-to-one correspondence. This means that the symbol used in the graph stands for many objects. For example, the school bus symbol used in Day 10 stands for ten students.



Many-to-one correspondence can also be used when constructing a bar graph.

### Une-to-Une Correspondence

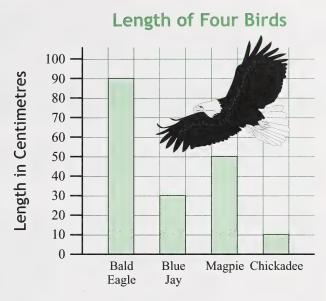
When one-to-one correspondence is used, the numbers along the vertical axis increase by one as you move up the axis. In other words, the interval used is 1 or **one unit**.

### Many-to-Une Correspondence

When many-to-one correspondence is used, each interval along the vertical axis stands for a number **greater than 1**. The interval used might be 2, 5, 10, or even 100, depending on the data you are showing on your graph.

Many-to-one correspondence is used in the following two graphs.

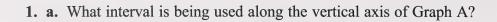
### Graph A

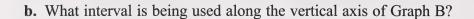


Type of Bird

Graph B









#### Check your answers in the Appendix.

It is a good idea to use many-to-one correspondence when you are working with large numbers. It makes the graph easier to read and easier to construct.

Think about what Graph B would look like if you used one-to-one correspondence. The largest number in the data is 225. You would have to use one tick or one grid square for each of the 225 hot dogs sold. That means you would need to make the bar for Saturday 255 grid squares tall! That would make a very tall graph.

By deciding to use many-to-one correspondence, you can make the height of the bars fit the size of your page or graph form.

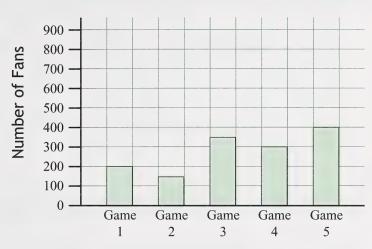


Remember: By changing the interval (how much each interval stands for), you can change the height of the bars.

Look at the following two bar graphs. Both graphs show the number of fans attending five minor league hockey games.

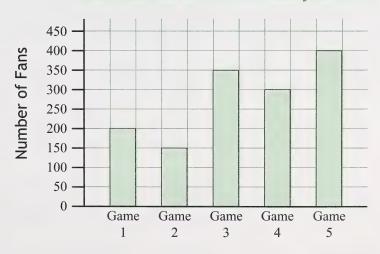
Graph C





Graph D

### Attendance at Five Hockey Games



2.	Use	Graphs	C	and	D	to	answer	these	questions.
----	-----	--------	---	-----	---	----	--------	-------	------------

a.	On both	graphs,	what i	s the	greatest	number	of	fans	at	one	game?

#### **b.** How much does each interval stand for

- in Graph C? \_\_\_\_\_
- in Graph D? \_\_\_\_\_
- c. When you make the interval smaller (50 instead of 100), are the bars taller or shorter?



Check your answers in the Appendix.

In Graph C the interval used is 100. As a result, the bars are shorter, and very little of the grid is used. In Graph D the interval is 50. Each tick stands for 50 fans. When 50 is used as the interval, the bars are taller and much more of the grid is used.

# How do you decide what numbers to use along the vertical axis?

First count the number of grid squares or ticks. This will tell you approximately how many numbers you need to place along the axis.

Once you know about how many numbers you will use, try skip-counting from zero to the greatest number in the data. If this number is very large, you may need to skip-count by 100, 1000, or even 10 000.

The number you skip-count by is the **interval** you will use along the vertical axis.

**3.** For each of the following questions, three choices are given. Decide which interval would be best to use on a bar graph to show each set of data. Circle the best answer.

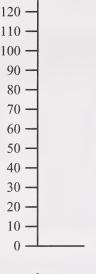
	Topic	Greatest Number in Data	Which is the best interval to use?			
a.	Favourite Hockey Teams of Grades 4-6	45 students	1	5	10	
b.	Ice-Cream Cones Sold	120 cones	1	10	50	
c.	Populations of Towns	9000 people	10	100	1000	
d.	Number of Days Absent	11 days	1	5	10	
e.	Depth of Lakes	400 m	10	50	100	
f.	Favourite TV Shows of Grade 4 Boys	22 boys	2	5	10	



Check your answers in the Appendix.

If a graph is drawn for each of the topics in question 3, the interval you choose will determine how many numbers will be used along the vertical axis.

For example, look at question 3.b.



• If 10 is used as the interval, there would be 13 numbers along the vertical axis.



• If 1 is used as the interval, there would be 120 numbers along the vertical axis.

**Note:** The symbol  $\checkmark$  means that some of the graph is not shown



• If 50 is used as the interval, only 4 numbers would be used along the vertical axis.

The best choice for an interval in question 3.b. is 10. It would give you 13 numbers along the vertical axis. This would be the easiest graph to read.

Usually, when many-to-one correspondence is used, the numbers along the vertical axis continue for one to two intervals beyond the greatest number in the data.

For example, in question 3.b., the greatest number in the data is 120.

**4.** If you were to add two or more numbers at the top of the vertical axis, what would they be? (Remember, that you are skip-counting by 10.)



Check your answers in the Appendix.



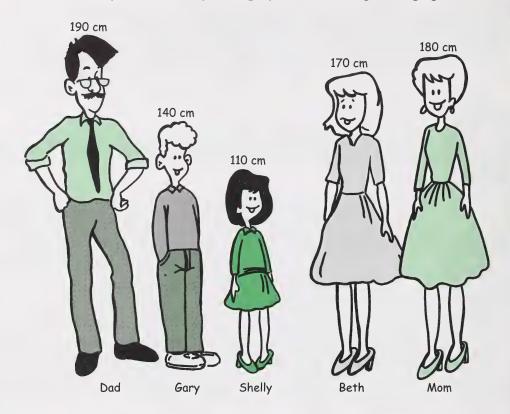
Many-to-one correspondence is used to "reduce" the amount of space you need when you construct a graph.

In bar graphs, the largest number in the data is shown as the tallest bar. If you make the interval along the vertical axis greater than 1, the height of the bars can be shortened.

Now it's time to use what you have learned and construct your own bar graph using many-to-one correspondence.

#### How Tall Are the Blackwells?

Suppose you collected data on the heights of the five members of the Blackwell family. How could you display the data using a bar graph?





Turn to Day 12 of the Cut-Out Learning Aids section in the Appendix. Remove the page called Day 12: Graph Form for the Blackwells.

For this graph, you will show the names of the family members along the horizontal axis and their heights along the vertical axis.

Look at the height shown above the picture of each person. Notice that the numbers are all quite large.

	this graph? Explain.
	Check your answer in the Appendix.
nstead, use ma	any-to-one correspondence, and let each interval stand for a.
Furn to your gr vertical axis.	raph form and count the number of grid squares along the
6. About how	many numbers can be placed along the vertical axis?
	Check your answer in the Appendix.
nterval on the 10 cm? 100 cm	nation to help you decide what value you will give to each vertical axis. Will each interval stand for 2 cm? 5 cm? 1? Choose an interval and skip count up the vertical axis to of the graph is used.
7. Which inter	val is the best choice for this graph form? Explain why.



### Check your answer in the Appendix.

Letting each interval stand for 10 cm is the best choice for this graph. If you skip count by 10s, you will need 19 ticks above the zero to record the greatest number (190).

**8.** Turn to the graph form and number up the vertical axis from 0 to 190, counting by 10s.

Usually one more interval is added above the largest number in the data. If you do this, the last tick will stand for 200 cm. Add this number to the top of the graph now.



#### Check your answer in the Appendix.

You are now ready to draw the bars.

- 9. a. What will each bar on the graph stand for?
  - **b.** How many bars are needed on the graph?
  - c. On the graph form draw the five bars. Use the spacing shown. Each grid square is 1 cm wide. Make each space 1 cm wide and make each bar 1 cm wide. Note that the bars have already been labelled for you. Use a ruler to make bars with straight sides. Colour the bars when you are finished.

Finally, you need to add labels and give your graph a title.

10. On the graph, label the horizontal axis. Then label the vertical axis. Finally, write a suitable title at the top that tells what the whole graph is about.



Check your answers in the Appendix.

Turn to Assignment Booklet 1B, and complete the activities for Day 12.



# **Observing Events**



Bigtown has an art show and sale every summer.

- How many visitors come to the show? How many men? How many women? How many children?
- How many pictures are sold? How many flower pictures? How many scenery pictures? How many people pictures?
- Where do the visitors come from?

Several kinds of data can be collected in many ways.

In Day 9 you presented data about your family on a graph based on information you collected through surveying or polling. When you conduct a **survey** or **poll**, you are gathering information first-hand by asking people directly for their opinion or for some information about themselves.

Not all data is gathered by polling. Data can be collected in a variety of ways:

- by observing events
- by using measuring devices
- by counting objects
- by using charts or tables
- by conducting experiments
- by examining pictures or photographs

Over the next few days, you will be looking more closely at some of these methods of collecting data.

## Collecting Data by Observing

You can collect data from something that you can see and easily record. One example of something you can collect data about is how many times a person blinks in 1 minute.

#### Collecting the Data

Blinking is an observable event. That means it is something you can see and that you can easily record. Explain to a friend or family member that you are



investigating how often people blink in 1 minute. Tell them that they should not think about blinking, but should carry on doing a normal activity, such as reading, eating, or watching TV, while you observe them for 1 minute.

1. Use a tally sheet to record ticks each time the person blinks. If possible, have someone else keep track of the time and tell you when 1 minute is up.

You should observe at least five people. Try to find people of different ages to see if age affects blinking. (**Note:** If you are surveying more than five people, use a separate piece of paer for the rest of your tally sheet.)

If you have a pet, you might want to observe how often your pet blinks!

Person Observed	Tally	Total Number of Blinks



Check your answers in the Appendix.

### Displaying and Interpreting the Data

- 2. Once you have collected the data on a tally sheet, use the information to draw a bar graph. Use the graph form on the next page.
  - Make the bars 3 grid squares wide with 1 grid square between them.
  - Put a title at the top of the graph and label each axis and each bar.
  - Colour your graph when you are finished.

Title: \_\_\_\_\_



Check your answers in the Appendix.

The data you collected tells you how many times someone blinks in 1 minute. You can use this data to estimate how often someone would likely blink in 2 minutes, in 5 minutes, or in 10 minutes.



If you wish, use a calculator to help you with the following calculations.

- 3. Choose one of the people you observed.
  - **a.** To find the number of times he or she would likely blink in 2 minutes, multiply the number of blinks you counted by 2.

Use a similar method to find how many times this person would blink in

**b.** 5 minutes

**c.** 10 minutes



Check your answers in the Appendix.



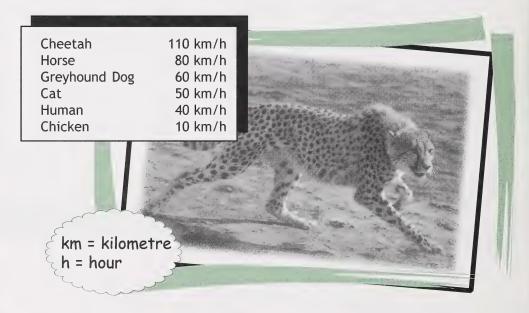
# **Taking Another Look**

The following activity is optional. You may choose to do it or not. You **should** complete the activity if you had difficulty with the questions in Day 12 or if you feel you just need more practice with many-to-one correspondence.

If you choose **not** to do the questions at this time, you may wish to return here later to review the concepts on many-to-one correspondence before completing the review activities for Day 16.

### Reviewing Many-to-One Correspondence

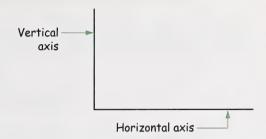
Here is a list of animals and the top speed at which each can travel. Make a bar graph to display this data.





Turn to Day 13 of the Cut-Out Learning Aids section in the Appendix. Remove the page called Day 13: Graph Form for Animal Speeds from the Appendix.

Use the vertical axis on the bar graph form to show the speed of each animal. Use the horizontal axis to list the type of animal.



- 1. The first step is to number the vertical axis.
  - **a.** Look at the numbers in the data. Would it be better to use one-to-one correspondence or many-to-one correspondence when numbering the vertical axis? Explain.



#### Check your answer in the Appendix.

Using many-to-one correspondence is a good idea when you are working with large numbers. It makes the graph easier to read and easier to construct.

**b.** What is the largest number in the data?

Turn to the graph form.

c. What interval would you use that would allow you to skip count from0 to 110 in the space provided on the graph form?



Check your answers in the Appendix.

The best answer is to make each interval stand for 10 km/h.

**d.** On the graph, write the numbers 0 to 110 along the vertical axis. Usually one more interval is added above the largest number.

The next number after 110 will be \_\_\_\_\_.

On the graph, add one more interval above 110.

Check your answers in the Appendix.

- 2. The next step is to draw the bars on the horizontal axis.
  - a. How many bars are needed for this graph? Explain.

To decide where the bars will be drawn, use the grid squares on the graph form to help you. The bars need to be spaced equally along the horizontal axis.

#### Remember:

- Start with a space.
- The width of all bars should be the same.
- All of the spaces between the bars should be the same.
- · End with a space.





**b.** On the graph form, put ticks along the horizontal axis to show where you will draw the six bars. Start with a space and make each bar and each space one grid square (1 cm) wide.

Check your answers in the Appendix.

If you have marked the ticks correctly along the horizontal axis, you are now ready to draw the bars.

3. Use a ruler to draw the six bars. Use the numbers on the vertical axis to help you decide how tall to make each bar. Then colour the bars using felts or crayons.

The last step when constructing a graph is to add labels and titles.

These are needed so that anyone reading the graph knows what information is being presented. You will need to label each axis. Finally, you should add a title at the top.

- 4. Turn to your graph.
  - Label each axis with a suitable title that tells what the axis shows.
  - Write a title at the top that describes what the whole graph shows.

Check your answers in the Appendix.



Turn to Assignment Booklet 1B, and complete the activities for Day 13.



# **Counting Objects**

Counting is another method for collecting data. Counting is an important way of gathering information about the things people prefer.



Many companies do counting surveys to find out things like how many people

- own a mini-van
- see a certain movie
- eat butter instead of margarine
- have a computer at home
- plan to vote for a certain person in an election

Counting can be used to find out how many of something there are.

### How Many Pairs of Shoes?

For this activity your job is to count the number of pairs of shoes that each member of your family owns. Include all kinds of footwear—boots, slippers, sandals, running shoes, and dress shoes.



Keep track of your data on the tally sheet and then use your data to construct a pictograph of the information.

1. Use this tally sheet to keep track of your data.

Family Member	Tally	Total

2. Draw your pictograph in the following space. Choose a symbol to stand for the shoes. You may need to use many-to-one correspondence if some members of your family own many pairs of shoes.

Title:	
	= pairs of shoes

**3.** Write three statements that are true based on the data presented in your pictograph.

•

• \_\_\_\_\_\_

•



Check your answers in the Appendix.

# Mental Math



In Day 3 you read about the importance of developing good mental math skills. Today you'll begin looking at strategies that will help you learn different ways to add numbers in your head.

Strategy: Adding the Place-Value Columns from Left to Right

This is a good strategy to use when you are adding several numbers that end in zeros.

### Example 1

600+40+200=

To do this addition in your head, add the largest place-value columns first (the hundreds). Then go to the next place-value column (the tens) and add those numbers.

Step 1: Find and add the hundreds.

$$600 + 40 + 200 = ?$$

$$\frac{600 + 200}{800}$$

**Step 2:** Find and add on the next place-value column (the tens).

$$600 + 40 + 200 = ?$$

$$800 + 40$$

$$840$$

As you add, try saying the numbers aloud to help you remember the placevalue column you are working on.

"6 HUNDRED plus 2 HUNDRED equals 8 HUNDRED."

"8 HUNDRED plus 40 equals 8 HUNDRED FORTY."



Remember: The key to making this strategy work is to go one step at a time. That is, add only two numbers at a time. Then, using that total, add on one more number. Repeat this until all numbers have been added.

#### Example 2

$$400+30+200+300=$$

Step 1: Find and add the hundreds first, one step at a time.

$$\frac{400 + 200}{600 + 300} = ?$$

Step 2: Find and add on the tens.

**4.** Now try solving the following questions in your head. Remember to add the largest place-value columns first.

**a.** 
$$400 + 100 + 50 =$$

**d.** 
$$30 + 40 + 5 + 10 =$$

**f.** 
$$200 + 60 + 100 + 600 =$$

**g.** 
$$9000 + 2000 + 400 =$$



### Check your answers in the Appendix.



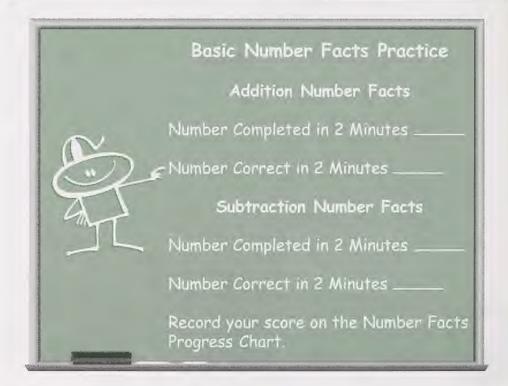
**Remember:** Practise your mental math skills whenever you can. The more you practise using these skills, the better "mental mathematician" you will become.

# **Basic Number Facts Practice**





Ask your home instructor to time you as you complete the following exercises. Your goal is to complete all 25 questions in each exercise in 2 minutes. At the end of 2 minutes, count up how many questions you were able to complete. Write this number in the chart below. Then use the answer key in the Appendix to mark the exercise, and record your score in the space provided. Before you move on, go back and complete any questions you did not finish during the 2 minutes. Mark these questions using the answer key as well.



5. Addition Number Facts **Timed Exercise: 2 minutes** 

$$7 + 8 =$$

$$8 + 9 =$$

$$7 + 5 =$$

$$7+8=$$
  $8+9=$   $7+5=$   $9+8=$   $6+9=$ 

$$6 + 9 =$$

$$9+9=$$
  $8+7=$   $9+6=$   $5+9=$   $9+4=$ 

$$8 + 7 =$$

$$9 + 6 =$$

$$5 + 9 =$$

$$9 + 4 =$$



Check your answers in the Appendix.

### 6. Subtraction Number Facts **Timed Exercise: 2 minutes**

$$16-8 = 15-9 = 13-6 = 12-8 = 14-7 =$$

$$15 - 9 =$$

$$13 - 6 =$$

$$12 - 8 =$$

$$14 - 7 =$$

$$15 - 7 =$$

$$12 - 9 =$$

$$14 - 5 =$$

$$15-7 = 12-9 = 14-5 = 13-5 = 15-8 =$$



Check your answers in the Appendix.

Turn to Assignment Booklet 1B, and complete the activities for Day 14.



# **Using Charts and Tables**



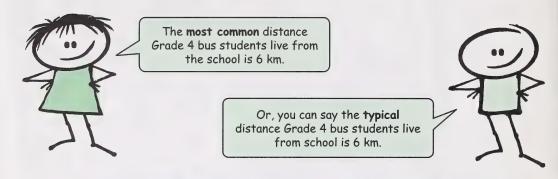
Which house in Myrtle's neighbourhood is oldest? Which house is the newest? How many different families have lived in each house?

Sometimes the data you need cannot be obtained **first-hand**. This means that you are not always able to go out and observe an event, or count, or measure in order to get the information you need. Instead, you must use **second-hand** data. This is data collected by other people and recorded on a chart or table.

You can see which number occurs most often. This is helpful because it tells you which "thing" is the most common or the most **typical**.

Do you remember working with line plots earlier in the module? A line plot is a quick and easy way to organize and make sense of data. You can take data from a chart and put it on a line plot. If you do this, you will see **patterns** form.

Look back at the line plot in Day 6 that shows the distance Grade 4 bus students live from school. You can easily tell which group is the largest.



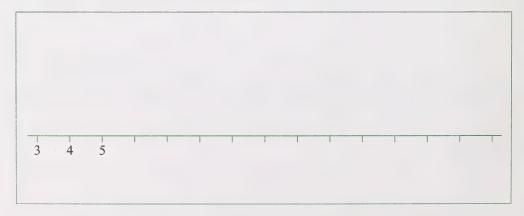
# Describing the Typical Apartment Block



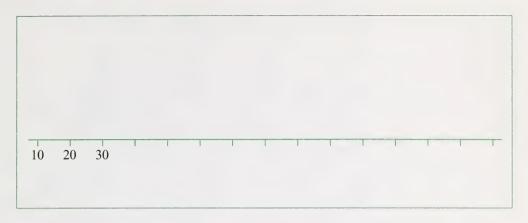
1. Turn to page 19 in your textbook. Look at the table that provides data about 12 apartment buildings in a city neighbourhood. Use the data to answer textbook question 1 on page 19. Write your answers in the spaces provided.

#### **Textbook question 1**

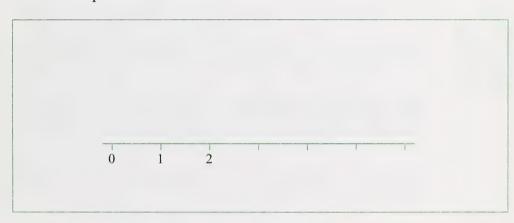
• line plot for number of storeys



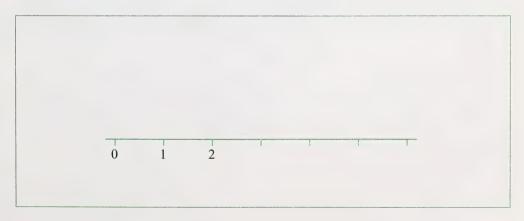
• line plot for number of apartments



• line plot for number of elevators



• line plot for number of entrances



Write a description of a typical apartment block in this neighbourhood. Be sure your description is based on your line plots and the data table in the textbook.



Check your answers in the Appendix.

# Mental Math



In Day 14 you learned about a mental math strategy that can be used when adding certain kinds of numbers. Today you'll look at another strategy for adding numbers in your head.

Strategy: Looking for Tens

If you ever have to add a list of numbers, first try looking for pairs of numbers that add up to ten.

Example

Step 1: Look for pairs that add up to ten.

$$\begin{array}{ccc}
5+5 & & 7+3 \\
\downarrow & & \downarrow \\
10 & & 10
\end{array}$$

Step 2: Add the tens.

$$10 + 10 = 20$$

**Step 3:** Add on the extra number(s).

$$20 + 6 = 26$$

2. Now try solving the following questions in your head. Look for tens first. Then add on any other numbers.

**a.** 
$$4+2+6=$$

**b.** 
$$7 + 7 + 8 + 3 + 2 =$$

**c.** 
$$5 + 9 + 1 =$$

**d.** 
$$2+3+9+1=$$

**e.** 
$$7 + 6 + 4 + 3 =$$

**e.** 
$$7+6+4+3=$$
 \_\_\_\_\_ **f.**  $1+8+3+9+2=$  \_\_\_\_\_

$$\sigma_{-} 9 + 8 + 1 + 8 + 2 =$$

**g.** 
$$9 + 8 + 1 + 8 + 2 =$$
 **h.**  $4 + 10 + 6 + 3 + 7 =$  \_\_\_\_\_

i. 
$$6+2+4+9+8 =$$

i. 
$$6+2+4+9+8 = _____$$
 j.  $7+2+6+5+4+5 = _____$ 



Check your answers in the Appendix.



Remember: Practise using your mental math skills whenever you get the chance. Look around your home and see if you can find pairs of numbers that equal ten.

# Interpreting Data in a Table



**3.** Turn to page 26 in your textbook. Do Skill Bank questions 1.a., 1.b., 2.a., and 2.b.



# Check your answers in the Appendix.

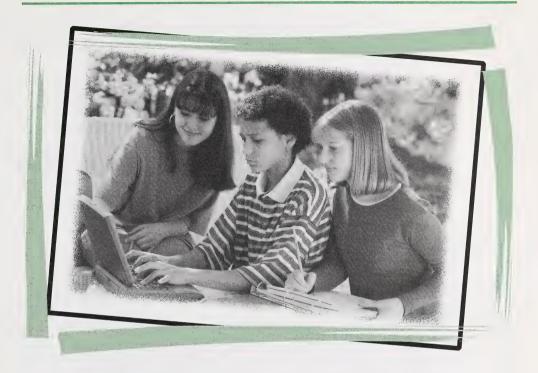


Look once again at question 2 on page 26 of the textbook. Note the words "on average." This tells you that the number of days of rain in a certain month were arrived at by recording this information many times (over a number of years). For example, the chart tells you that January has ten rainy days. Some Januarys likely had more rainy days, and some likely had fewer rainy days, but "on average" January usually has ten rainy days.

Turn to Assignment Booklet 1B, and complete the activities for Day 15.



# Putting It All Together



In Module 1 you learned many new things about data management:

- You explored different reasons for collecting data.
- You learned how to conduct a survey.
- You saw several ways of collecting and recording data.
- You learned about line plots, bar graphs, and pictographs.
- You practised drawing pictographs and bar graphs.
- You practised solving problems.
- You worked on basic number facts.

Today you will show what you have learned about data management by completing several review questions. Then you will complete a Challenge Activity. It will help you expand your thinking about data management.

# Part 1: Reviewing the Concepts

For Part 1, you will complete the review activities for Day 16 in Assignment Booklet 1B. First, you may wish to look back through the Student Module Booklet to review any of the concepts you have forgotten.

# Part 2: Challenge Activities

The Challenge Activities are designed to extend the ideas you have been learning about, and encourage you to explore new ideas about data management. In your Assignment Booklet you will find two Challenge Activities. Complete **either** Activity A **or** Activity B (or you may do both if you wish).

Turn to Assignment Booklet 1B, and complete the review activities in Part 1. Then do one or both of the Challenge Activities in Part 2.



# Assessing What You Know (II)

Today is the last day you will be working in Module 1: Data Management. You will complete three activities in Assignment Booklet 1B:

- Showing What You Can Do
- Basic Number Facts
- Thinking About What You Know

Read the explanation of the activities in Parts 1, 2, and 3 before turning to Assignment Booklet 1B. Note that you will need the help of your home instructor for the activities in Parts 1 and 2.



# Part 1: Showing What You Can Do



For this activity you will need the help of your home instructor. You will be working on a short activity while your home instructor observes you. As you work through the problem, try to explain clearly what you are doing.

Your home instructor may ask you questions such as:

- "How do you know that?"
- "Why did you decide to do that?"
- "How did you get that answer?"

Your job is to explain what you are doing so that your home instructor can understand your thinking.



#### Note to the Home Instructor

This performance assessment should take about 15 minutes. The Home Instructor's Assessment Page and accompanying Student's Assessment Page can be found in Day 17 of Assignment Booklet 1B. Remove both pages from the Assignment Booklet. Read over the student's page so you are familiar with the student's assigned task. You should also preview the interview questions and the checklist before the student begins work on the assigned task.

As the student works to answer the questions, encourage him or her to talk about what he or she is doing. Allow the student to use any manipulatives or cut-out learning aids available to help solve the problem. You may or may not wish to use some of the interview questions. Look for understanding and the student's ability to explain clearly what he or she is doing to arrive at an answer. Indicate on the checklist whether you feel the student demonstrated the skills being assessed.

Attach both assessment pages to the Assignment Booklet before sending it in for marking.

# Part 2: Basic Number Facts

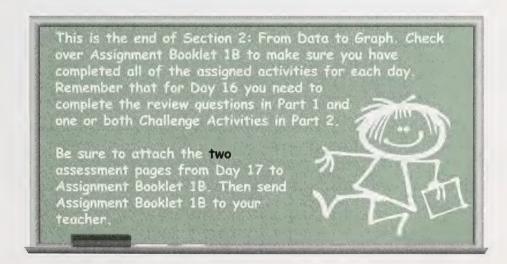
In this activity you will show how well you are doing at learning your basic number facts for addition and subtraction. Ask your home instructor to time you as you do each test.

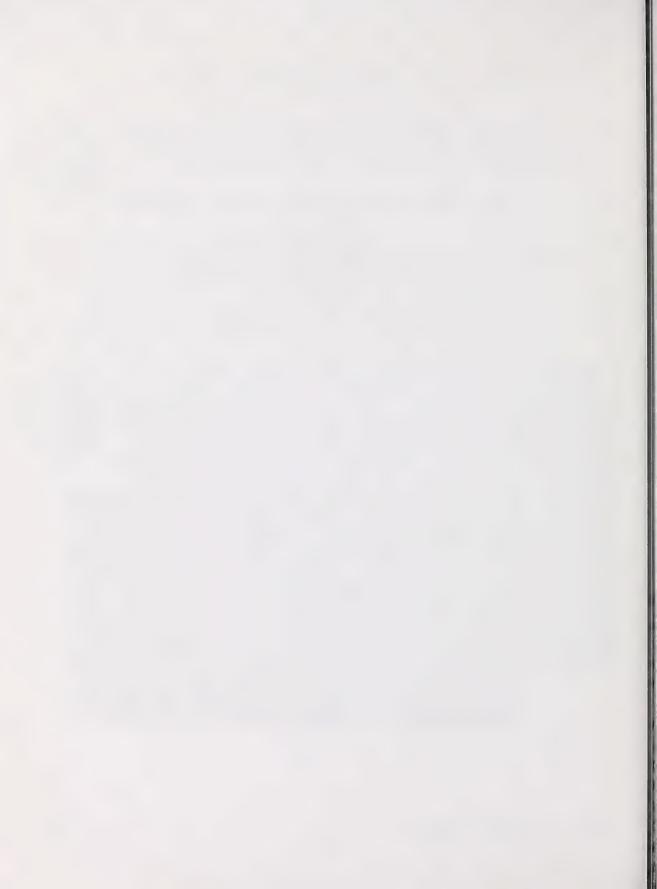
# Part 3: Thinking About What You Know

In this activity you will spend some time looking back over the work you have done in the Student Module Booklet. Then you will complete some statements that tell about things you liked about the module, things you didn't understand, and things you would like to learn more about. This information will be helpful to your teacher in determining how well you understood the information presented in the module.

When your home instructor is ready, turn to Assignment Booklet 1B and complete the activities found in Parts 1, 2, and 3 of Day 17.









Glossary

**Problem-Solving Strategies** 

Answer Key to Self-Marking Activities

**Cut-Out Learning Aids** 

**Number Facts Progress Chart** 



# Glossary

**arm span:** the distance between the fingertips of a person's outstretched arms

axis: the horizontal or vertical number line on a graph

The plural of axis is **axes** (pronounced  $a\hat{x}$ -eez).

bar graph: a graph that presents information by using horizontal bars or vertical bars

data: facts and figures that can be organized to provide information

data management: the collecting, organizing, and interpreting of data

**interval:** the space between any two ticks along the vertical axis of a bar graph

In one-to-one correspondence, the interval stands for 1 unit (for example, 1 person, 1 animal, 1 centimetre, etc.).

In many-to-one correspondence, the interval stands for a number greater than 1 (for example, 5 books, 10 metres, 1000 people).

line graph: a graph that displays information by using points joined together by line segments

line plot: a method of displaying number data by making marks above a group of numbers on a number line; sometimes called a number-line plot

many-to-one correspondence: a method of displaying number data on a graph

On pictographs, the symbol being used stands for more than one person or thing being counted. On bar graphs, each interval along the vertical axis stands for more than one person or object.

one-to-one correspondence: a method of displaying data on a graph

On pictographs, one symbol stands for one person or thing being counted. On bar graphs, each interval along the vertical axis stands for one person or thing being counted.

pictograph: a graph that presents information (such as the results of a survey) by using pictures or symbols

**poll:** a survey, usually one asking people which choice they prefer or how they will vote in an election

random sample: a sample of people in which all members of the population have an equal chance of being chosen

related number sentences: a set of number facts (usually four facts) made up of the same numbers

Two addition facts and two subtraction facts can make up a family.

For example,

$$7 + 9 = 16$$

$$9 + 7 = 16$$

$$16 - 9 = 7$$

$$16 - 7 = 9$$

Two multiplication facts and two division facts can also make up a family.

For example,

$$4 \times 8 = 32$$

$$8 \times 4 = 32$$

$$32 \div 4 = 8$$

$$32 \div 8 = 4$$

response sheet: a sheet used to record the actual answers of the people being surveyed; may be used instead of a tally sheet

sample: a small group used to provide information about a larger group; also called a sample population

**survey:** one or more questions asked of a sample of people to obtain information

**table:** an orderly arrangement of facts or numbers set out in rows or columns for easy reference

tally marks: the marks used to record the frequency of data

Each group of five tally marks is usually recorded as a group of four vertical lines with one line across it.

$$HHT = 5$$
  $HHT II = 7$ 

tally sheet: a record of tally marks arranged in order to show the number of times something occurs

typical: the word used to describe what is most common or what things are usually true about data that has been collected

**Example:** The data shows that a typical house in our neighbourhood has three bedrooms.

# **Problem-Solving Strategies**

Seven problem-solving strategies are included in Mathematics 4 as examples of useful strategies for Grade 4 students. Remember that there are usually many ways to solve any problem. You do **not** have to use the strategies in the order they are given. First, use the strategy you think will be best. Also, remember that no one strategy will work for all problems. Try to become familiar with as many strategies as you can as you work through the course.

For each strategy, use the four-step process for problem solving:

- Step 1: Understand the problem.
- Step 2: Make a plan. (Choose a strategy.)
- Step 3: Try the plan.
- Step 4: Look back.

You can find the strategies on the following pages:

. 140
. 145
. 149
. 152
. 157
. 162
. 168

# Acting Out the Problem



For some problems, you may find it helpful to physically act out the actions in the problem. This may mean that you need the help of other people to do the actions with you, or you may need objects that you can physically move with your hands. If you don't have the real objects, you can use paper cutouts instead.

# Example 1

Silas bought a used baseball glove from a friend for \$15. He sold the glove to another friend for \$21. Then he bought the glove back for \$16. He later sold the glove again for \$25. How much money did he make or lose?

### Step 1: Understand the problem.

Think: I need to find out how much money Silas made or lost after buying and selling a baseball glove several times.

# Step 2: Make a plan. (Choose a strategy.)

Use the Acting Out the Problem strategy.

### Step 3: Try the plan.

You can use play money to do the actual buying and selling with another person. This may help you to better understand what is happening in the problem. Decide on an amount of money to start with. This example starts with \$30.

- Action 1: Buy the glove. Count out \$15 and give it to your friend. \$30 \$15 = \$15 (You have \$15 left.)
- Action 2: Sell the glove. Your friend gives you \$21. \$15 + \$21 = \$36 (Now you have \$36.)
- Action 3: Buy the glove back from your friend. Count out \$16 and give it to your friend. \$36 \$16 = \$20 (Now you have \$20.)

Action 4: Sell the glove. Your friend gives you \$25. \$20 + \$25 = \$45 (You end up with \$45.)

Did you make money or did you lose money after all these actions? To find out, check back to see how much you started with and compare the amount with how much you have at the end. You started with \$30 and ended up with \$45. You have more money at the end than when you started.

$$$45 - $30 = $15$$

You made \$15.

#### ANSWER TO THE PROBLEM

Silas made \$15.

or

Silas had \$15 more at the end than when he started.

### Step 4: Look back.

Read the problem again. Ask, "Did I answer the question?"

Review your calculation. Ask, "Is my answer reasonable?"

## Example 2

Mr. Chan was organizing school supplies in a display case in his store. The display case had 3 shelves, one above the other, with 2 spaces on each shelf.

The supplies included the following:

• pencils

erasers

• rulers

• lined paper

scribblers

• binders

Mr. Chan put the pencils next to the scribblers and above the erasers. He did **not** put the lined paper next to the scribblers or the erasers. The rulers were **not** placed next to the lined paper. Where did Mr. Chan put each of the supplies? **Note:** "Next to" can mean beside, above, or below.

# Step 1: Understand the problem.

Think: I need to find out where Mr. Chan placed each of the 6 types of school supplies.

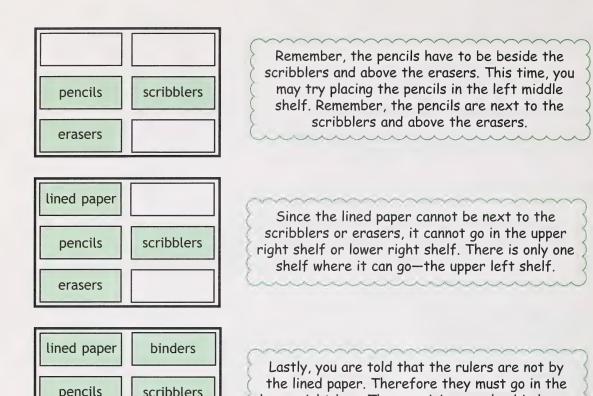
# Step 2: Make a plan. (Choose a strategy.)

Use the Acting Out the Problem strategy.

# Step 3: Try the plan.

At first, the information about where each supply is located may seem confusing. However, by labelling 6 cards (or pieces of paper) to represent each of the 6 types of supplies, you can move the supplies around from shelf to shelf based on the information given in the problem.

pencils erasers	scribblers	The first thing you are told is that the pencils are next to the scribblers and above the erasers.  Here is one way to place the first three cards.
pencils erasers	scribblers	Next, you are told the lined paper is not next to the scribblers or erasers. This means you can only place lined paper in the lower right shelf.
pencils erasers	scribblers	Next, you are told that the rulers are not placed next to the lined paper. There is a problem now, because the only shelves left are both next to the lined paper. This means you have made a mistake in placing one or more of the supplies.  You must go back to the beginning and try again!



#### ANSWER TO THE PROBLEM

Mr. Chan arranged the school supplies in the display case in the following way:

lower right box. The remaining supply—binders—would go on the upper right shelf.

• Top shelf: lined paper, binders

rulers

- Middle shelf: pencils, scribblers
- Bottom shelf: erasers, rulers

### Step 4: Look back.

erasers

Read the problem again. Check each of your answers to be sure they agree with the information given in the problem. Ask, "Have I answered the question being asked? Is my answer reasonable?"

# Guess and Check



One good way to solve certain kinds of problems is to make a reasonable guess at the answer, and then check to see if the guess is correct by using the information provided in the problem. Sometimes your first guess may turn out to be correct. Usually, however, you will need to use what you learned from your first guess to make a better second guess. Often you will have to go through many guesses before you find the correct answer.

It is important to remember that in order to be able to give a reasonable guess each time, you need to think about

- · what information you know from the problem
- what you learned from your incorrect guesses

# Example 1

Dennis counted 15 animals in the barnyard. Some were pigs and some were chickens. Chad counted a total of 42 legs. How many pigs and how many chickens were there?

# Step 1: Understand the problem.

Think: I know how many legs there are in all. I know how many animals there are in all. I also know that pigs have 4 legs and chickens have 2 legs. I need to find out how many pigs there are and how many chickens there are.

# Step 2: Make a plan. (Choose a strategy.)

Use the Guess and Check strategy.

# Step 3: Try the plan.

The first thing you need to do is think about what you know and what you have been told in the problem. Then make a **reasonable** guess.

For this problem, you know there are 15 animals in all, so guessing 10 pigs and 10 chickens would be a poor guess. (10 + 10 = 20 animals) The sum of both guesses must equal 15. If you think about what you know from the problem, a more reasonable guess would be 10 pigs and 5 chickens.

Pigs ( $\times$  4 legs) Chickens ( $\times$  2 legs) Total Legs Guess 1: 10 (40 legs) 5 (10 legs) 50 legs

The total number of legs is too large, so you need to guess again. Before you guess, stop and think about what you know. There are 42 legs in the barnyard and your first guess gave 50 legs. What would be a reasonable second guess?

To decrease the number of legs, you can decrease the number of pigs or the number of chickens. If you take a pig away, you decrease the number of legs by 4, but you will need to add a chicken, which will add 2 legs, so that you have 15 animals.

You could try 5 pigs and 10 chickens.

Pigs ( $\times$  4 legs) Chickens ( $\times$  2 legs) Total Legs Guess 2: 5 (20 legs) 10 (20 legs) 40 legs

This time the total number of legs is too low. Notice that you are closer to 42, so your second guess was a reasonable one. It brought you closer to the correct answer. You are only 2 legs away from 42. How can you increase the number of legs by 2 but keep the number of animals at 15?

Try 6 pigs and 9 chickens.

Pigs (× 4 legs) Chickens (× 2 legs) Total Legs
Guess 3: 6 (24 legs) 9 (18 legs) 42 legs

Adding 1 pig makes 16 animals and adds 4 legs. Taking away 1 chicken makes 15 animals and takes away 2 legs, for a total of 42 legs.

#### ANSWER TO THE PROBLEM

There were 6 pigs and 9 chickens in the barnyard.

# Step 4: Look back.

Read the problem again. Ask, "Have I answered the question being asked?"

Check each answer (number of pigs, number of chickens, total number of legs) to see if each answer is reasonable, based on the information given in the problem.

# Example 2

Lynn scored 99 points playing a dart game using this board.

- How many darts did she throw?
- Where did they hit the target?

# Step 1: Understand the problem.

Think: I need to figure out how many darts Lynn threw and where they landed to get a score of 99 points.



## Step 2: Make a plan. (Choose a strategy.)

Use the Guess and Check strategy.

# Step 3: Try the plan.

The first thing to do is review what you know from the problem and the picture. The picture shows different values for different rings on the dartboard. Try to make a **reasonable** guess of scores that add up to 99. (Guessing that Lynn threw two darts—one on 15 and one on 19—would **not** be reasonable since the total of the two scores is not close to 99.)

Guess 1: Lynn used 5 darts. Two darts landed on 19, two landed on 17, and one landed on 15.

$$19 + 19 + 17 + 17 + 15 = 87$$

The total of the five scores is too low, so you need to guess again. Think about what you learned from your incorrect guess to make a reasonable second guess. You know you need to increase your guess by 12 so that the total score is equal to 99. There is no point score on the dartboard equal to 12, so you will need to add some points and take away some so that the total you are adding on equals 12.

Guess 2: Use your first guess to start.

$$19 + 19 + 17 + 17 + 15 = 87$$

- Add 15.  $\longrightarrow$  15 + 19 + 19 + 17 + 17 + 15 = 102 (Too much)
- Subtract 19.  $\longrightarrow$  15 + 19 + 17 + 17 + 15 = 83 (Too little)
- Add 16. 16 + 15 + 19 + 17 + 17 + 15 = 99 (Correct!)

By adding 15, subtracting 19, and then adding 16, you are really adding on 12. There is a total of 6 darts.

#### ANSWER TO THE PROBLEM

Lynn threw 6 darts. They landed on the following point scores: 15, 15, 16, 17, 17, and 19.

### Step 4: Look back.

Read the problem again. Ask, "Did I answer both questions?" Check over your calculation. Ask, "Are my answers reasonable?" If you have time, you might also want to ask, "Is this the only possible answer, or is there more than one answer to this problem?"

# Making an Organized List



Sometimes a problem asks you to find all the combinations or all the possibilities. In order to keep track of all the data, it is helpful to put the data into an organized list. It will help you make sure you have found all the possibilities. It will also help you avoid listing any of the combinations or possibilities twice.

### Example 1

Suppose you had  $40\phi$  to spend at a candy booth at the fair. The booth sells lollipops for  $10\phi$ , bubble gum for  $5\phi$ , and licorice for  $4\phi$ . How many different combinations of candy could you buy for  $40\phi$ ?

### Step 1: Understand the problem.

Think: I need to find all the different possible combinations of candy that I could buy for 40¢.

# Step 2: Make a plan. (Choose a strategy.)

Use the Making an Organized List strategy.

# Step 3: Try the plan.

To ensure you find all possible combinations, you need to record your data in an organized way. You know there are only certain combinations of  $10\phi$ ,  $5\phi$ , and  $4\phi$  that will equal  $40\phi$ , so you can look at all the combinations for buying lollipops first, then bubble gum, and then licorice.



Lollipops (10¢ each)	Bubble Gum (5¢ each)	Licorice (4¢ each)
4	0	0
3	2	0
2	4	0
2	0	5
1	6	0
1	2	5
0	8	0
0	4	5
0	0	10

The top section lists all the combinations when buying lollipops. The middle section lists all the combinations when buying only bubble gum or licorice. The bottom section lists one combination when buying only licorice.

#### ANSWER TO THE PROBLEM

There are 9 different combinations of candy that a person could buy for 40¢.

### Step 4: Look back.

Reread the problem. Ask, "Have I answered the question being asked?"

Then check over your calculations to make sure each of the 9 combinations of candy do add up to  $40\phi$ . Ask, "Is my answer reasonable, based on the information given in the problem?"

# Example 2

Chris has  $25\phi$  in his pocket. How many possible combinations of coins (quarters, dimes, nickels, and pennies) are there that equal  $25\phi$ ?

## Step 1: Understand the problem.

Think: I need to find all the different ways to make 25¢ using quarters, dimes, nickels, and pennies.

# Step 2: Make a plan. (Choose a strategy.)

Use the Making a List Strategy.

### Step 3: Try the plan.

In order to keep track of all the combinations, you should make an organized list. Start with the coin with the greatest value, and work through each combination until you've reached the coin with the smallest value.

The value of each line added across is 25¢.

			USS NAO?
1	0	0	0
0 0 0 0 0	2 2 1 1 1	1 0 3 2 1 0	0 5 0 5 10 15
0 0 0 0	0 0 0 0	5 4 3 2 1	0 5 10 15 20
0	0	0	25

#### ANSWER TO THE PROBLEM

There are 13 possible combinations of coins that equal 25¢ using quarters, dimes, nickels, and pennies.

# Step 4: Look back.

Read the problem again. Ask, "Did I answer the question being asked?" Check your calculations to make sure the value of each line equals 25¢. Ask, "Does my answer (13 combinations) seem reasonable, based on the information given in the problem?"

# Drawing a Diagram



For some problems, it is a good idea to draw a diagram, especially when it is not easy to picture in your mind what is being described in the problem. A diagram will often make things clearer to you than they would be if you just read through the problem.

# Example 1

A firefighter stood on the middle rung of a ladder spraying water on a burning building. An explosion made her climb down 7 rungs. She later climbed up 15 rungs where she worked until the fire was out. After that she climbed the remaining 3 rungs to the top of the ladder. How many rungs did the ladder have?

# Step 1: Understand the problem.

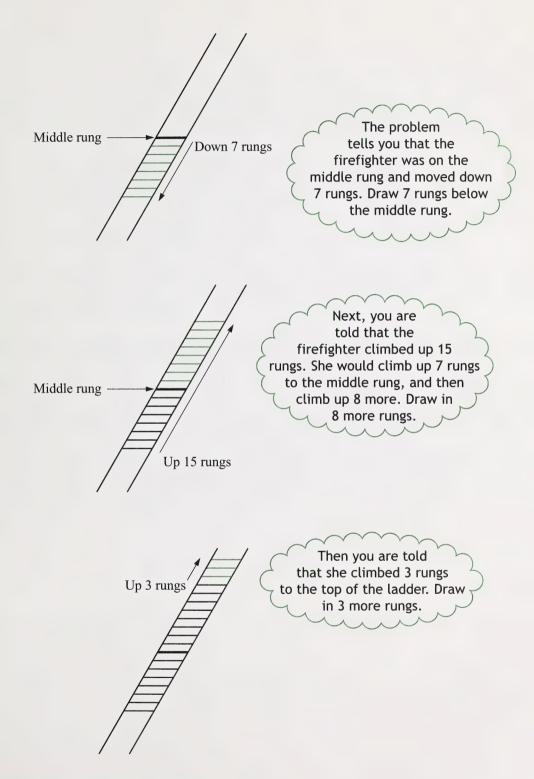
Think: I need to find how many rungs are on the ladder. I know the firefighter moved from the middle rung down 7 rungs, up 15 rungs, and then up 3 rungs to the top.

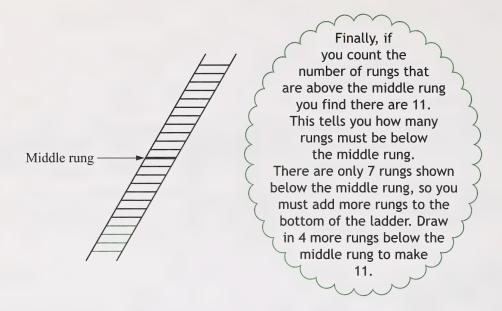
# Step 2: Make a plan. (Choose a strategy.)

Use the Drawing a Diagram strategy.

# Step 3: Try the plan.

Drawing a diagram will help you to see where the middle rung is. Then you can draw in the remaining rungs and count to see how many rungs the ladder has.





Now you can now count (or calculate) the number of rungs on the ladder.

11 rungs above	11
1 middle rung	1
11 rungs below	11
TOTAL	23

#### ANSWER TO THE PROBLEM

The ladder had a total of 23 rungs.

# Step 4: Look back.

Reread the problem. Ask, "Does the sentence I wrote answer the question being asked in the problem?"

Check your calculations. Ask, "Did I add the correct number of rungs to the ladder at each step according to the information in the problem?"

### Example 2

Four friends had a contest to see who could build the tallest tower in 1 minute using building blocks. Frank's tower was 2 blocks taller than Theo's. Cindy's tower was 5 blocks taller then David's. Theo's tower was 3 blocks shorter than Cindy's. David's tower was 5 blocks high.

- Who built the tallest tower?
- How many blocks high was Frank's tower?

### Step 1: Understand the problem.

Think: I need to find the answer to two questions in this problem. First, I need to find which of the four friends built the tallest tower. Second, I need to find out how tall Frank's tower was.

# Step 2: Make a plan. (Choose a strategy.)

Use the Drawing a Diagram strategy.

### Step 3: Try the plan.

Since the problem talks about block towers of different heights, drawing a diagram to show the four towers should help you see which is tallest and also show how many blocks high each tower is.

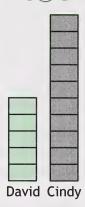
Which tower can you draw first? If you read through all the information given in the problem, you learn the height of one tower.

David's tower is 5 blocks high.

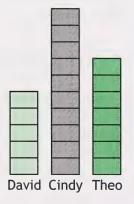
Draw David's tower.



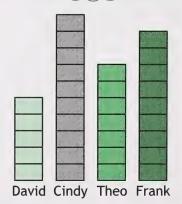
You also know
that Cindy's tower is
5 blocks taller than David's.
You can draw Cindy's tower
10 blocks high.



The problem also
tells you that Theo's tower is
3 blocks shorter than Cindy's tower.
If Cindy's tower is 10 blocks high,
Theo's would be 7. You can draw
Theo's tower.



Finally, you are told
that Frank's tower is 2 blocks
taller than Theo's. If Theo's tower is
7 blocks high, Frank's tower must be
9 blocks high. You can draw
Frank's tower.



Now you are able to compare all four towers. You can see whose tower is tallest and you can count to see how tall Frank's tower is.

#### ANSWER TO THE PROBLEM

Cindy built the tallest tower, which is 10 blocks high. Frank's tower was 9 blocks high.

#### Step 4: Look back.

Read the problem again. Ask, "Did I answer both of the questions being asked in the problem?"

Check your diagrams. Ask, "Do my diagrams correctly show the information in the problem? Have I drawn the correct number of blocks for each tower?"

# Making a Table or Chart



Some problems contain a lot of data or require you to come up with a lot of data. A table or chart is a useful way to display the data. A table or chart allows you to see what data you already have and what data is still missing. A table also helps you to see any patterns that might be forming with the numbers you are working with.

### Example 1

Dennis counted 15 animals in the barnyard. Some were pigs and some were chickens. Chad counted a total of 42 legs. How many pigs and how many chickens were there?

## Step 1: Understand the problem.

Think: I know how many legs there are in all. I know how many animals there are in all. I also know that pigs have 4 legs and chickens have 2 legs. I need to find out how many pigs there are and how many chickens there are.

# Step 2: Make a plan. (Choose a strategy.)

Use the Making a Table strategy.

# Step 3: Try the plan.

This problem is a good example of one that can be solved using many different strategies. You have already solved this problem using the Guess and Check strategy, so this time you'll put the information you know into a table.

You know there are 15 animals—some pigs and some chickens.

The smallest number of chickens possible is 1. If there was 1 chicken, there would be 14 pigs. The total number of legs for this combination (1 chicken and 14 pigs) could be shown as

1 chicken 
$$(\times 2 \text{ legs})$$
 2 legs  
14 pigs  $(\times 4 \text{ legs})$  56 legs  
TOTAL 58 legs

Next find the number of legs for other combination of chickens and pigs.

# • 2 chickens and 13 pigs

2 chickens 
$$(\times 2 \text{ legs})$$
 4 legs  
13 pigs  $(\times 4 \text{ legs})$  52 legs  
TOTAL 56 legs

# • 3 chickens and 12 pigs

3 chickens 
$$(\times 2 \text{ legs})$$
 6 legs  
12 pigs  $(\times 4 \text{ legs})$  48 legs  
TOTAL 54 legs

# • 4 chickens and 11 pigs

4 chickens 
$$(\times 2 \text{ legs})$$
 8 legs  
11 pigs  $(\times 4 \text{ legs})$  44 legs  
TOTAL 52 legs

Now you can put the information you know so far into a table.

Number of Chickens	1	2	3	4	***	?
Number of Pigs	14	13	12	11		?
Total Number of Legs	58	56	54	52		?

If you examine the data in the table, you can see some patterns forming. As the number of chickens increases, the number of pigs decreases.

Now look at the total number of legs. As you move across the table from left to right, you notice that there are fewer legs each time you add a chicken and take away a pig.

Therefore, to reduce 52 legs to the 42 legs that Chad counted, you need 10 fewer legs. You could add 5 chickens (10 legs) and take away 5 pigs (20 legs), resulting in 10 fewer legs.

Add 5 more chickens.

#### ANSWER TO THE PROBLEM

There were 6 pigs and 9 chickens in the barnyard.

# Step 4: Look back.

Reread the problem. Ask, "Did I answer the question that the problem was asking?"

Check your calculation for the answer. Ask, "Do 9 chickens and 6 pigs have 42 legs in total? Is this answer reasonable?"

# Example 2

Four hockey teams met for their league tournament. The teams were the Hawks, the Bears, the Elks, and the Wolves. How many games were played if each of the teams played each of the other teams twice?

### Step 1: Understand the problem.

Think: I need to find out how many games would be played in a tournament involving 4 teams if each team plays every other team 2 times.

# Step 2: Make a plan. (Choose a strategy.)

Use the Making a Table strategy.

## Step 3: Try the plan.

By making a table or chart, the number of games can be easily counted. Also, you can easily check to see that each team plays the correct number of times.

Because there are four teams, make a four-by-four grid, and label the team names across the top and down one side.

Since a team cannot play against itself, four of the squares need to be shaded in. By matching each team down the left side with each team along the top, you can see that each team will play each of the three teams twice.

	Hawks (H)	Bears (B)	Elks (E)	Wolves (W)
Hawks (H)		H vs B	H vs E	H vs W
Bears (B)	B vs H		B vs E	B vs W
Elks (E)	E vs H	E vs B		E vs W
Wolves (W)	W vs H	W vs B	W vs E	

Note that Hawks versus Bears and Bears versus Hawks show a game between the same teams.

#### ANSWER TO THE PROBLEM

If each of the teams played each other twice, there would be 12 games played in the tournament.

# Step 4: Look back.

Read the problem again. Ask, "Did I answer the question being asked?"

Check over your table. Ask, "Did I count correctly? Does each team play against each of the other teams twice? Does my answer sound reasonable?"

# Looking for a Pattern



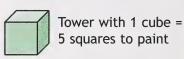
One very useful strategy in problem solving is being able to see if a pattern is occurring and, if it is, to use the pattern to accurately predict the answer to the problem.

# Example 1

For this problem you may find it helpful to use interlocking cubes or cube-shaped wooden blocks to model what is happening.

Janis and Otto were building towers by gluing cube-shaped wooden blocks one on top of the other. Each tower was one cube higher than the previous tower.

After the towers were glued together Janis began to paint them. She noticed the tower that was only 1 cube high had 5 squares to paint (4 sides and a top). The bottom (base) was not painted.



For a tower that was 2 cubes high, Janis counted 9 squares that had to be painted.



Tower with 2 cubes = 9 squares to paint

Find the number of squares that would need to be painted on towers

- 3 cubes high
- 4 cubes high
- 10 cubes high

# Step 1: Understand the problem.

Think: I need to find the number of squares to be painted on towers that are 3, 4, and 10 cubes high. I don't count the square on the bottom (base) of each tower.

### Step 2: Make a plan. (Choose a strategy.)

Use the Looking for a Pattern strategy.

### Step 3: Try the plan.

One way to see if a pattern is forming is to put the data you know from the problem in a chart or table. Using a T-table is an easy way of doing this.

Number of	Number of
Cubes	Squares
1	5
2	9

Number of

**Squares** 

5

9

Number of

Cubes

1

2

3

To find the number of squares that could be painted on a tower of 3 cubes, you could build a model or draw a picture. Then, count the squares and add the information to the table.



Look for a pattern forming in the T-table. As you read down the right-hand side of the table, notice how the number of squares increases by 4 each time another cube is added. Knowing this, you can easily predict that the number of squares to be painted for 4 cubes will be 17 squares.

Number of Cubes	Number of Squares
1	5 \
2	9
3	13
4	17 4

You found the number of squares for a 4-cube tower by discovering the pattern on the right-hand side of the T-table. To find the number of squares for a 10-cube tower, you could continue filling in the table, adding 4 squares for each additional square.

Number of Cubes	Number of Squares
1	5
2	9
3	13
4	17
5	21 <
6	25 < +4
7	29 💉 +4
8	33 💉 +4
9	37 🚽 +4
10	41 🔎 +4

Can you find another pattern that could help you to calculate the number of squares? Reading across, you see that to change the number in the first column to the number in the second column, you **multiply** the number of cubes by 4 and add 1.

1 cube	$(1\times4)+1$
	4 + 1 = 5 squares
2 cubes	$(2\times4)+1$
	8 + 1 = 9 squares
3 cubes	$(3\times4)+1$
	12 + 1 = 13  squares

Number of Squares
5
9
13
41

Knowing this pattern, you can calculate the number of squares for 10 cubes without filling in the entire T-table.

10 cubes 
$$(10 \times 4) + 1$$
  
40 + 1 = 41 squares

In fact, you can jump much further ahead and easily calculate the number of squares on a tower that is 100 cubes tall.

100 cubes 
$$(100 \times 4) + 1$$

$$400 + 1 = 401 \text{ squares}$$
Number of Cubes Squares
$$(100 \times 4) + 1$$

$$100 \longrightarrow 401$$

#### ANSWER TO THE PROBLEM

On a 3-cube tower, 13 squares would need to be painted. On a 4-cube tower, 17 squares would need to be painted. On a 10-cube tower, 41 squares would need to be painted.

#### Step 4: Look back.

Read the problem again. Ask, "Did I answer all of the questions being asked in the problem?"

Review your calculation. Ask, "Do all the numbers in my T-table follow the pattern? Did I calculate the number of squares correctly for each tower? Are my answers reasonable?"

#### Example 2

Priscilla has 12 coins arranged in the following pattern. What is the total value of her 12 coins?



### Step 1: Understand the problem.

Think: I need to discover the pattern in the line of coins. Then I need to draw in the next five coins. Finally, I need to find the value of the 12 coins.

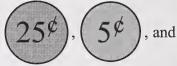
### Step 2: Make a plan. (Choose a strategy.)

Use the Looking for a Pattern strategy.

### Step 3: Try the plan.

In this problem, you are looking at how different coins have been placed in a line to see if you can discover the pattern (something that repeats). In order to find the repeating

pattern, start at the beginning of the line. The first three coins,



 $10^{\circ}$ , are all different. There is no repeating pattern.

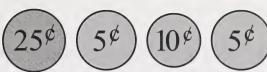
The fourth coin is (5); it is the same as the second coin. But, you are looking for a sequence or group of coins that repeats, beginning with the first coin.

When you look at the first five coins, you see  $(25)^{c}$  repeating. Since this was the

first coin, it's a clue that this **might** be the pattern beginning to repeat again. If you look at all seven coins, you can see that the pattern formed by the first four coins seems to be repeating.



If the repeating pattern is



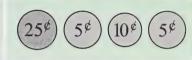
sequence of four coins should be the same. Therefore, the eighth coin would be



, and the third group of four coins would repeat the sequence again.







, then the next

Now that the last five coins are known, you can calculate the total value of the 12 coins. This can be done by counting, by adding on paper, or by using a calculator.

$$3 \times 25 \phi = 75 \phi$$

$$3 \times 10 c = 30 c$$

$$6 \times 5 \phi = 30 \phi$$

$$TOTAL = 135¢ \text{ or } \$1.35$$

### ANSWER TO THE PROBLEM

The total value of all 12 coins is \$1.35.

### Step 4: Look back.

Reread the problem. Ask, "Did I do what the problem asked? Did I answer all the questions that need to answered?"

Check your calculation. Ask, "Did I label the coins correctly? Is my adding (or counting) correct? Is my answer reasonable as a total value for 12 coins?"

### Making It Simpler



This strategy is useful when you are faced with a problem that seems difficult because too many numbers are involved or because the numbers are too large. By using smaller or fewer numbers, the problem is made simpler and becomes easier to solve. Once you have solved the simpler problem, you can apply what you know to solving the original problem.

### Example 1

How many times is the number 5 used to number the pages of a book that is 500 pages long?

### Step 1: Understand the problem.

Think: I need to find the number of times the number 5 appears in the page numbers of a book that is 500 pages long.

### Step 2: Make a plan. (Choose a strategy.)

Use the Making It Simpler strategy.

### Step 3: Try the plan.

When you first look at this problem, you might think the way to solve it would be to write out all of the numbers from 1 to 500 and then count the 5s. That is one possible strategy. However, there is a better, **simpler** method. Instead of finding all of the 5s at once, try finding the 5s for only the first 100 pages. To do this, think of how many times 5 appears on a hundreds chart.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

There are 19 fives on a hundreds chart, so the number 5 would be used 19 times to number the first 100 pages in a book.

For a book 500 pages long, there would be

$$5 \times 19 = 95$$
 fives

or

$$19 + 19 + 19 + 19 + 19 = 95$$
 fives

There would also be one more number 5 used to number page 500. This makes a total of 96 fives in all.

#### ANSWER TO THE PROBLEM

The number 5 is used 96 times to number the pages of a book that is 500 pages long.

#### Step 4: Think back.

Read the problem again. Ask, "Did I answer the question being asked?"

Review your calculation. Ask, "Did I count all of the 5s used on the hundreds chart carefully? Did I add or multiply correctly to find the number of 5s used up to 500? Does my answer sound reasonable?"

### Example 2

A window cleaner was washing the windows of a downtown office building that was 8 storeys high. There were 14 offices on each floor, with 7 offices across the back of the building and 7 offices across the front. The front offices each have 3 windows, and the back offices each have 2 windows. How many windows are there in all that have to be washed?

### Step 1: Understand the problem.

Think: I need to find the total number of windows that must be washed. I know there are 8 storeys. I know there are 7 offices along the front of the building and 7 offices along the back of building. I also know that each of the front offices has 3 windows, and each of the back offices has 2 windows.

### Step 2: Make a plan. (Choose a strategy.)

Use the Making It Simpler strategy.

#### Step 3: Try the plan.

This problem sounds complicated because it has so many numbers in it. In order to make the problem simpler, you can break it down into simpler parts and use only a few numbers at a time.

Rather than calculate the total number of windows in the building all at once, you can calculate the number of windows per floor, and then use that information to find the total number of windows for the building.

Storey 1: There are 7 offices at the front. Each office has 3 windows.

$$7 \times 3 = 21$$
 windows

There are 7 offices at the back. Each office has 2 windows.

$$7 \times 2 = 14$$
 windows

Total windows for Storey 1: 21 + 14 = 35 windows

Using the information for 1 storey, you can calculate the number of windows for all 8 storeys.

$$8 \times 35 = 280$$
 windows

or

$$35 + 35 + 35 + 35 + 35 + 35 + 35 + 35 = 280$$
 windows

#### ANSWER TO THE PROBLEM

There are a total of 280 windows that have to be washed.

#### Step 4: Look back.

Read the problem again. Look at the information given and at the question being asked. Ask, "Did I answer the question?"

Check over your calculation. Ask, "Did I use the number amounts from the question correctly? Does my answer seem reasonable?"

# Answer Key to Self-Marking Activities

### Day 1: What Is Data Management?

- 1. The data presented in the first TV-program guide page is easy to use. Programs are organized by time, so that all programs on at the same time are grouped together. Also, the TV stations are listed in alphabetical order.
- 2. Programs in the second TV-program guide page are organized alphabetically. This makes the guide more difficult to use. If you were sitting down to watch TV at a certain time, and you wanted to know which programs were on at that time, you would have to read through all of the listings on the page.

# Day 2: Why Data Is Collected

- 1. Many answers are possible. Two examples are given.
  - You could try to observe when family members are reading and record for how long they read. (This would be difficult since you wouldn't be able to observe all family members all of the time during the day.)
  - You could ask each member of your family to keep track of how much time he or she spends reading throughout the day. If each person wrote these times down on paper, you could collect the papers and record the totals.
- 2. The three most popular places were West Edmonton Mall, Royal Tyrrell Museum, and Head-Smashed-In Buffalo Jump.
- 3. Many answers are possible. Graphs are often used because they are an interesting way to share data. Graphs can be colourful, and they present data in a simple way that makes the data easier to understand.

- 4. Many answers are possible. Some of the other things Freddie needs to find out are
  - the distances between the three places they plan to visit
  - the time it takes to travel between each of the three places
  - the cost of travel by car
  - the cost of staying at each place (hotel, campground, meals, entrance fees, etc.)

# Day 3: Conducting a Survey

- 1. Many answers are possible. Three sample questions are given.
  - What size of shoe do you normally wear?
  - What colour of shoe do you prefer to wear?
  - How much do you usually pay for a pair of shoes?
- 2. Which one of your questions did you feel was most important? Will the answer to this question tell you the most about what you need to know?
- **3.** It probably would not be possible to survey everyone in the town. There are many reasons:
  - It would take too much time.
  - It would be difficult to make sure no one was missed.
  - Some people (children) would be too young to answer the questions.
- **4.** If you survey only one group (for example, senior citizens, students, men, or women), the data you collect may not be true for another group in the town population. Therefore, it is important that the sample population being surveyed is a mixture of all types or groups of people in the town.
- 5. Several answers are possible. Two sample answers are given.
  - Stand on a street corner and ask every fifth person who passes by.
  - Go door-to-door and stop at every third house.

# Day 4: Collecting and Recording Data

1. Jeremy's process for collecting data was better. He surveyed students from all grade levels at the school. His data probably tells what toppings a greater variety of students prefer.

Nadia's survey results tell only about Grade 1 and Grade 2 students. These results don't tell what toppings the students in other grades prefer.

After completing both surveys, Mrs. Mellott's class may decide to offer both kinds of pizza at their sale: pepperoni and ham **and** cheese.

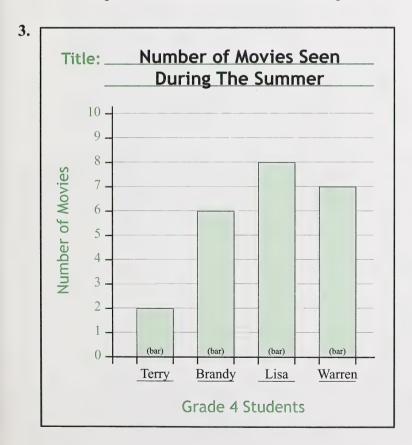
- 2. Answers may vary. Tally sheets are normally used to record how many of something (for example, how many birds at a bird feeder). Response sheets are used when different kinds of things are being recorded (for example, the types of birds that were seen).
  - a. response sheet
- **b.** tally sheet
- **c.** response sheet
- d. tally sheet
- 3. Many answers are possible. An example is shown.

Would you rather?	Prediction	Tally	Total
go rollerblading	3	111	5
go biking	5	1111	4
go swimming	2	•	1

Did you find that your predictions were close to the actual totals? Were some people's answers surprising?

### Day 5: Displaying Data

- 1. a. The title is Money Earned by Babysitting Club.
  - **b.** The vertical axis shows how much each club member earned.
  - c. Four club members are shown along the horizontal axis.
- 2. There are two things wrong with this bar graph:
  - The numbers on the vertical axis are not equally spaced. It appears that Lisa saw many more movies than the other students, when in fact she saw only one more than Warren, and only two more than Brandy.
  - The spaces between the bars should be equal.



- 4. Addition Number Facts

# Day 6: Interpreting Line Plots

- 1. a. 5 students
  - **b.** 6 km
  - **c.** 10 km
  - d. 22 students
  - **e.** False (Only 10 students travel 7 km or more to school. This is less than half of 22 students.)
- 2. Quest 2000 Page 16

### On Your Own, Question 1

Many answers are possible. Here are three examples:

- This group of students jumped between 7 and 25 times.
- Four students jumped 17 times.
- Only one student jumped rope 25 times.

Many conclusions are possible. Here are two examples:

- Most Grade 4 students jumped between 15 and 19 times.
- Most Grade 4 students jumped 12 or more times.

3. a.

Quest 2000 Page 16

#### **Practise Your Skills**

Many answers are possible. Here are some examples:

Question	Answer
How old is the youngest member?	8 years old
How many students belong to the camera club?	27
How old is the largest group that is all the same age?	12 years old
How many members are teenagers?	16
Most of the members are in what age range?	12 to 14 years

b. Quest 2000 Page 16

### Practise Your Skills, Question 2

Many answers are possible. Some sample titles are:

- Age of Camera Cub Members
- Camera Club Members' Ages

- 4. Subtraction Number Facts
  - 4 4 6 7 8 8 8 9 8 6 7 5 7 9 5
  - 8 9 9 5 9
  - 7 9 6 9 6

### **Taking Another Look**

1. The Xs are not evenly spaced and are not the same size. This makes it difficult to interpret the data without counting each column of Xs first.

					×			
		×		×	×			
		×	×	×	×			
	×	×	×	×	×			
	×	×	×	×	×	×		
×	×	×	×	×	×	×	×	
0	1	1 2	3	4	5	6	7	

- **3. a.** 5 boxes
  - **b.** 14 students
  - c. Zero is needed to show that one student didn't sell any boxes of chocolates.
  - d. 27 students

# Day 7: Interpreting Bar Graphs and Pictographs

- 1. Many answers are possible. Some sample answers are given.
  - Greg watched the most TV in one week.
  - Mark watched the least TV in one week.
  - Greg watched 7 more hours of TV than Ellen.
  - Susan watched 2 more hours than Ellen.
  - All four students watched 8 or more hours of TV.
- 2. a. elephant
  - **b.** rhinoceros
  - c. rhinoceros, walrus, moose
  - d. 2500 kg
- 3. a. Half of the symbol stands for one box.
  - b. Magda 4 boxes
    - Corinne 8 boxes
    - Carol 11 boxes
    - Linda 7 boxes
  - c. Carol
  - **d.** 30 boxes
  - e. 3 boxes
- **4. a.** Day 7
  - **b.** 25 km
  - **c.** 225 km
  - **d.** 175 km
  - e. Day 3 and Day 6
  - **f.** 1450 km

### Taking Another Look

- 1. a. hamburger
  - b. 15 students
  - c. 20 more students
  - d. 80 students
- 2. a. 9 students
  - **b.** 10 more students
  - c. 64 students
  - d. Grade 1
  - e. Grade 4 and Grade 6

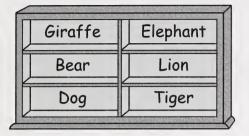
### Day 8: Problem Solving

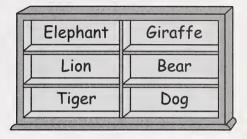
- 1. Answers will vary. Perhaps you thought of some of these solutions:
  - Go out to a restaurant to eat.
  - Wait until someone buys more milk.
  - Visit a neighbour and ask if you can borrow some milk.
- 2. Answers will vary. A sample answer is given.

Eating something else may be the best solution. It's easy to do, you can probably find something else you enjoy eating, and the problem is solved quickly.

- 3. On which shelf did Reena put each of the stuffed animals?
- **4. a.** The bear is above the dog. Therefore, the bear must go on one of the middle shelves or one of the top shelves.
  - b. The lion will go beside the bear (either to the left or the right of the bear).
  - c. The dog is directly below the bear.

**5.** Does your solution agree with all of the statements in the problem? Your answer should look like one of these.





**6.** There are two possible ways to arrange the animals, based on the information given in the problem.

By moving the bear to the opposite side of the middle shelf, a new arrangement is possible. (The two arrangements are shown in the answer to question 5.)

# Day 9: Assessing What You Know (I)

All activities are to be done in Assignment Booklet 1A. This work will be marked by your teacher.

Day 10: Constructing Pictographs

1.	Favourite Fruit	Number of Students	Total
	Apple	HH 111	8
	Orange	Ш	3
	Banana	1111	4
	Strawberry	441	6

2. Your pictograph should look like this:

Title: Fa	avourite Fruits of Grade 4 Students			
Apple	全全全全全全全全			
Orange	全全全			
Banana A A A				
Strawberry	全个个个个个个个个个个个个个个个个个个个个个个个个个个个个个个个个个个个个个个			
= 1 student				

3.

Type of Bird	Number of Times Seen	Total
American Goldfinch	HH 11	7
House Wren	11	2
Black-Capped Chickadee	441	5
Yellow Warbler	(	1
White-Throated Sparrow	111	3

4. Your pictograph should look like this:

Title: Birds Seen During One Week in June			
American Goldfinch	BBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBB		
House Wren	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		
Black-Capped Chickadee	かかかゆゆ		
Yellow Warbler			
White-Throated Sparrow			
= 1 bird			

- 5. 5 students
- 6. 20 students
- 7. 45 students (Four whole buses stand for 40 students, and half a bus stands for 5 students.)
- **8.** It would involve too much drawing. (Too many symbols would need to be drawn.) This would take a lot of time and require a large graph. (For example, 60 students in Grade 3 ride the bus. Using one-to-one correspondence, you would have to draw 60 school-bus symbols.)

9.

Title: Number of Different Kinds of Stores in Brookville

Type of	Number of Stores
Тоу	
Drugstores	
Clothing	
Jewelry	
Grocery	
Hardware	
Others	
Each =	4 stores

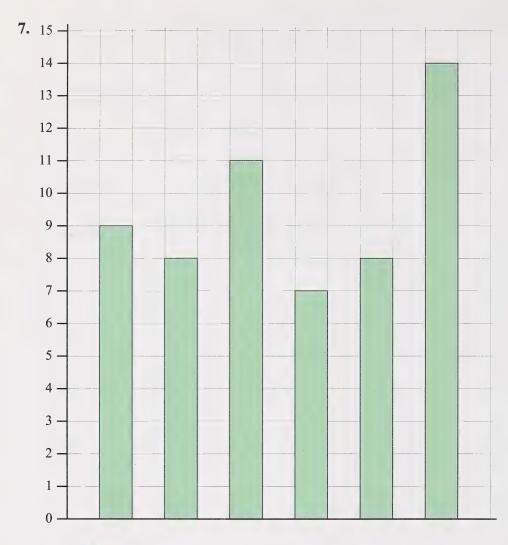
# Day 11: Constructing Bar Graphs (I)

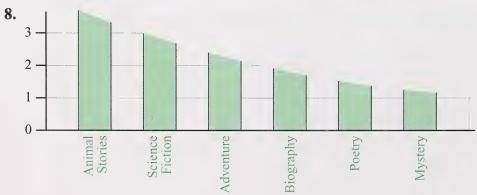
- 1. a. Animal Stories9Biography7Science Fiction8Poetry8Adventure11Mystery14
  - b. Mystery 14

- 2. Either 15 or 16 could be used as the top tick on the vertical axis.
- **4.** Each interval is **one** (standing for one book).
- 5. Six bars

0 -

**6.** 15 -14 -13 -12 -11 10 9 8 7 -6 -5 -4 -3 -2 1. 0 bars



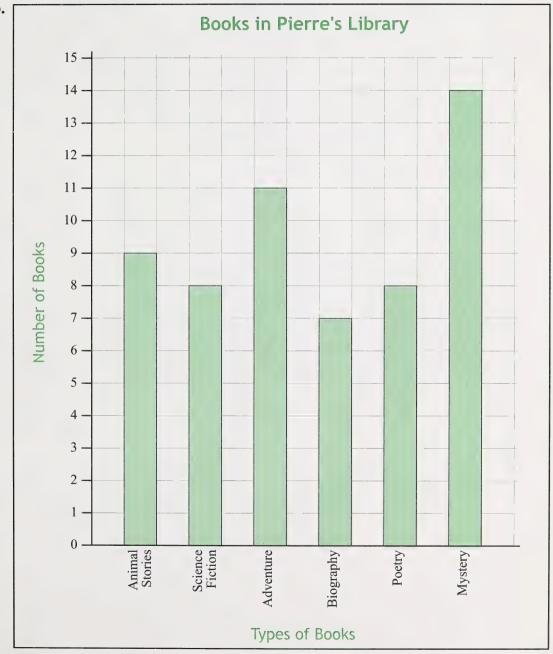


#### 9. a. Number of Books

**b.** See answer 10.b. Suitable labels are shown.

### 10. a. Books in Pierre's Library

b.



11. a. 
$$9+4$$

c. 
$$6 + 8$$

$$9 + 4 = 13$$
  
 $4 + 9 = 13$   
 $13 - 4 = 9$   
 $13 - 9 = 4$ 

$$8 + 7 = 15$$
  
 $7 + 8 = 15$   
 $15 - 7 = 8$   
 $15 - 8 = 7$ 

$$6 + 8 = 14$$
  
 $8 + 6 = 14$   
 $14 - 6 = 8$   
 $14 - 8 = 6$ 

12. Some number fact families have only two related sentences because two of the numbers in each related sentence are the same. For example, in 9 + 9 = 18, there are two 9s. Reversing the order of the two numbers being added does not create a new related sentence. When the two numbers being added are **not** the same, changing the order creates a new related sentence.

For example: 
$$6 + 9 = 15$$

$$15 - 9 = 6$$

$$9 + 6 = 15$$

$$15 - 6 = 9$$

13. Addition Number Facts

15

8

7

8

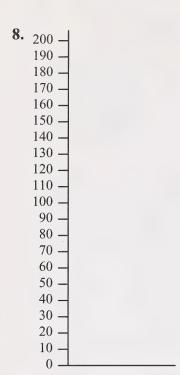
4

14. Subtraction Number Facts

7

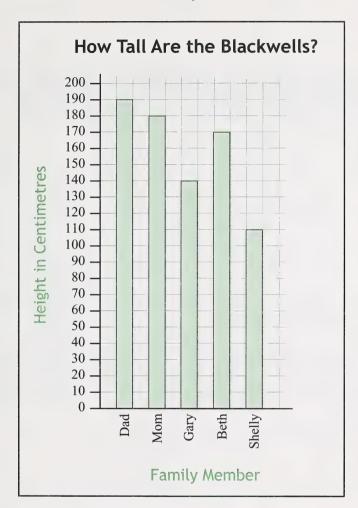
### Day 12: Constructing Bar Graphs (II)

- 1. a. 10 or 10 cm
  - **b.** 25 or 25 hot dogs
- 2. a. 400 fans
  - **b.** Graph C: 100 fans Graph D: 50 fans
  - c. taller
- 3. a. 5
  - **b.** 10
  - **c.** 1000
  - **d.** 1
  - e. 50
  - **f.** 2
- 4. 130, 140
- 5. No, it probably would not be a good idea to use one-to-one correspondence for the bar graph showing the heights of the Blackwells. Each interval along the vertical axis would stand for 1 cm. The largest number in the data is 190 cm, so you would need 190 intervals along the vertical axis.
- **6.** about 20 numbers
- 7. The best choice is an interval of 10. The graph form has room for 20 intervals. If each interval is 10, then skip counting by 10 will give you 200 cm at the top of the vertical axis. This is just slightly larger than the largest number in the data (190 cm).



- 9. a. Each bar will stand for a member of the Blackwell family.
  - **b.** Five bars are needed.
  - c. See the completed graph in answer 10.

10. Your graph should look like this. You may have different labels and a different title.



# Day 13: Observing Events

1. Answers will vary. Here is an example.

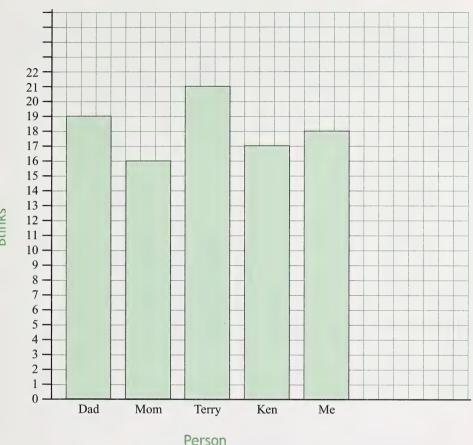
Person Observed	Tally	Total Number of Blinks
Dad	#######	19
Mom	######1	16
Terry	######	21
Ken	#######	17
Me	######## 111	18

2. Answers will vary. The sample answer given on the next page is based on the sample tally sheet in the answer to question 1.

The vertical axis shows the number of blinks. The interval will vary depending on the greatest number of blinks recorded. In this example, each interval stands for 1 blink. The greatest number of blinks by one person was 21.

Label the bars along the horizontal axis with the name of each person (or pet) observed.

Title: Number of Blinks per Minute



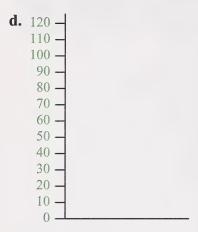
- 3. Answers will vary. The sample answers shown here show calculations for Terry.
  - a.  $21 \times 2 = 42$  blinks in 2 minutes
  - **b.**  $21 \times 5 = 105$  blinks in 5 minutes
  - **c.**  $21 \times 10 = 210$  blinks in 10 minutes

### Taking Another Look

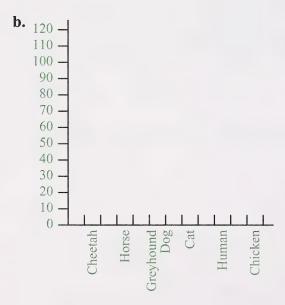
1. a. Because some of the numbers are large, you will not want to use one-to-one correspondence. To do so would mean using one interval for each kilometre per hour of speed. This means you would need as many as 110 intervals along the vertical axis!

#### **b.** 110 km/h

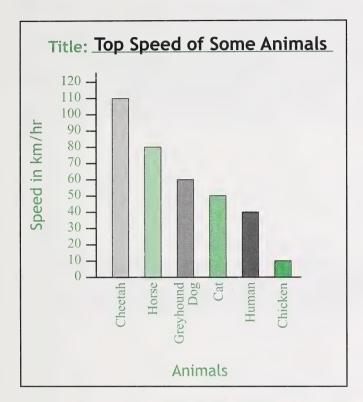
**c.** The best interval to use is 10. There are 13 intervals on the graph form. If you skip count by 10, the top number on the vertical axis will be 120. This is just slightly larger than the largest number in the data (110 km/h).



2. a. Six bars will be needed because there are six animals.



- 3. See the completed graph in the answer to question 4.
- 4. Your graph should look like this.



Day 14: Counting Objects

- 1. Answers will vary. Did you ask permission before searching for shoes? Did you put your tallies in groups of five for easier counting?
- 2. Answers will vary. Check to see that your pictograph has each of the following:
  - a title at the top
  - the vertical axis labelled (names of family members)
  - a statement of how many pairs of shoes each symbol stands for
  - the symbols are all the same size, equally spaced, and lined up correctly

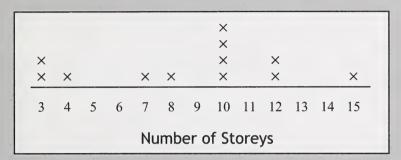
- 3. Many different answers are possible. Here are some examples:
  - ? has more pairs of shoes than ??..
  - ? has the most pairs of shoes in our family.
  - has as many pairs of shoes as ?? and ? combined.
  - ? has the fewest pairs of shoes.
- **4. a.** 550
  - **b.** 980
  - **c.** 990
  - **d.** 85
  - **e.** 1040
  - **f.** 960
  - **g.** 11 400
  - **h.** 9100
  - i. 7300
  - j. 7800
- 5. Addition Number Facts
  - 13 16 12 12 14
  - 15 17 12 17 15
  - 13 14 14 12 13 18 15 15 14 13
  - 13 12 16 16 14
- 6. Subtraction Number Facts
  - 4 6 7 5 8
  - 8 6 7 4 7
  - 8 9 9 5 6
  - 8 3 9 8 7
  - 5 9 9 9 7

# Day 15: Using Charts and Tables

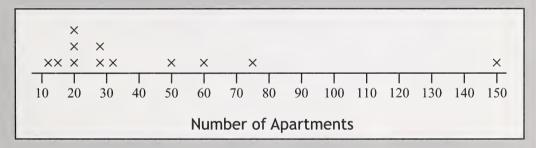
### 1. Quest 2000 Page 19

### On Your Own, Question 1

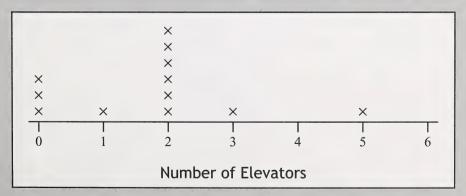
1. • line plot for number of storeys



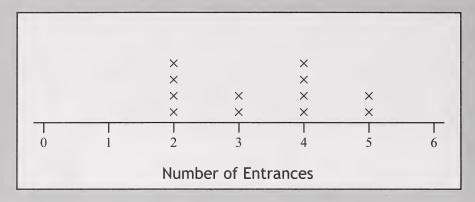
• line plot for number of apartments



• line plot for number of elevators



• line plot for number of entrances



• Many answers are possible. Here is an example:

A typical apartment block in this neighborhood is 10 storeys tall, and has 20 apartments and 2 elevators. It is made of brick and has 2 to 4 entrances. It was built in the 1970s.

**2. a.** 
$$(4+6)+2=12$$

**b.** 
$$(7+3)+(8+2)+7=27$$

**c.** 
$$(9+1)+5=15$$

**d.** 
$$(9+1)+2+3=15$$

e. 
$$(7+3)+(6+4)=20$$

**f.** 
$$(1+9)+(8+2)+3=23$$

$$\mathbf{g} \cdot (9+1) + (8+2) + 8 = 28$$

**h.** 
$$(4+6)+(3+7)+10=30$$

i. 
$$(6+4)+(2+8)+9=29$$

**j.** 
$$(6+4)+(5+5)+7+2=29$$

### 3. Quest 2000 Page 26

## Skill Bank, Questions 1 and 2

- 1. a. The most common or typical travelling time is 11 min to 15 min.
  - b. 27 students were surveyed.
- 2. a. Anytime in the months of May through September.
  - b. The number of rainy days every month would have been observed over a period of many years, and the typical or most common number would have been used in the table.

# Day 16: Putting It All Together

All activities are to be done in Assignment Booklet 1B. This work will be marked by your teacher.

# Day 17: Assessing What you Know (II)

All activities are to be done in Assignment Booklet 1B. This work will be marked by your teacher.

# **Credits**

Some clip art drawings are commercially owned.

### Information for the Home Instructor

Practising Number Facts: EyeWire, Inc. Helping Students with Mathematics PhotoDisc, Inc. 2000

### Introductory Pages

Basic Number Facts: EyeWire, Inc. Computers: PhotoDisc, Inc. 2000 Journal Writing: PhotoDisc, Inc. 2000

### Page

1 PhotoDisc, Inc. 2000

- 3 EyeWire, Inc.
- 5 RubberBall Productions/EyeWire,
- 10 PhotoDisc, Inc. 2000
- 20 PhotoDisc, Inc. 2000
- 26 PhotoDisc, Inc. 2000
- 37 RubberBall Productions/EyeWire,
- 45 RubberBall Productions/EyeWire,
- 53 RubberBall Productions/EyeWire,
- 62 RubberBall Productions/EyeWire,

- 64 EyeWire, Inc.
- 67 EyeWire, Inc.
- 72 EyeWire, Inc.
- 75 Image Club/StudioGear/EyeWire, Inc.
- 87 EyeWire, Inc.
- 90 EveWire, Inc.
- 108 RubberBall Productions/EyeWire, Inc.
- 112 Corel Corporation
- 131 EyeWire, Inc.
- 133 PhotoDisc, Inc. 2000

Day 8: Stuffed Animals and Display Case

Lion

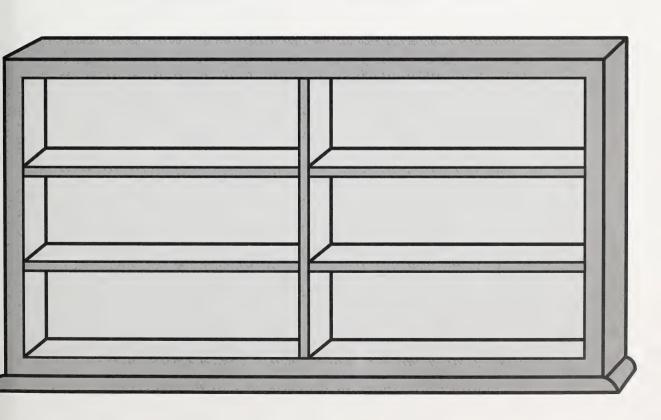
Dog

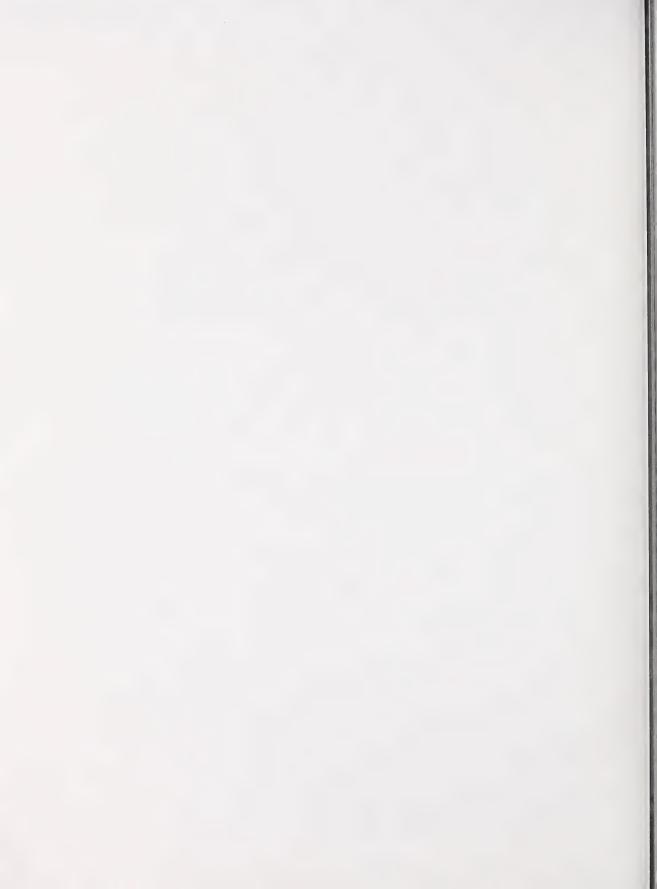
Elephant

Bear

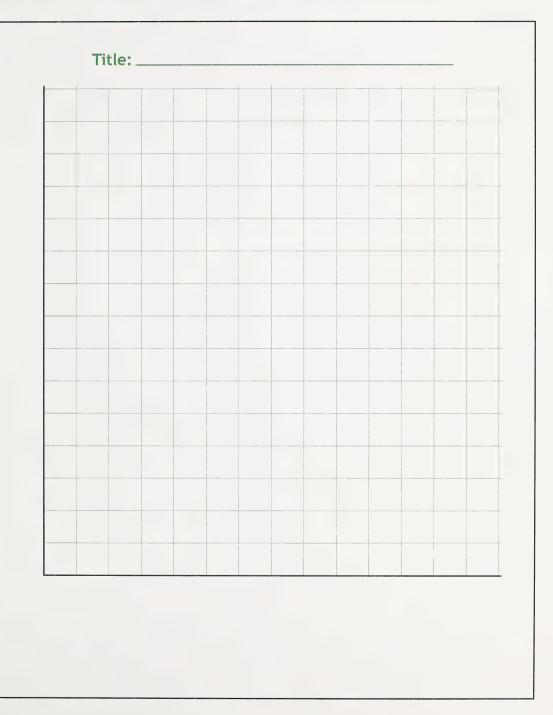
Tiger

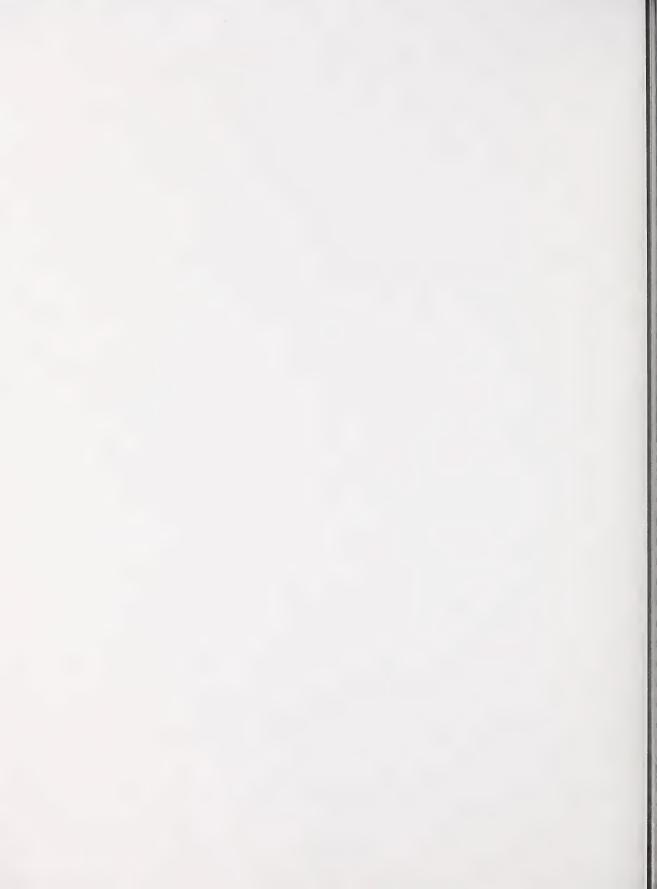
Giraffe



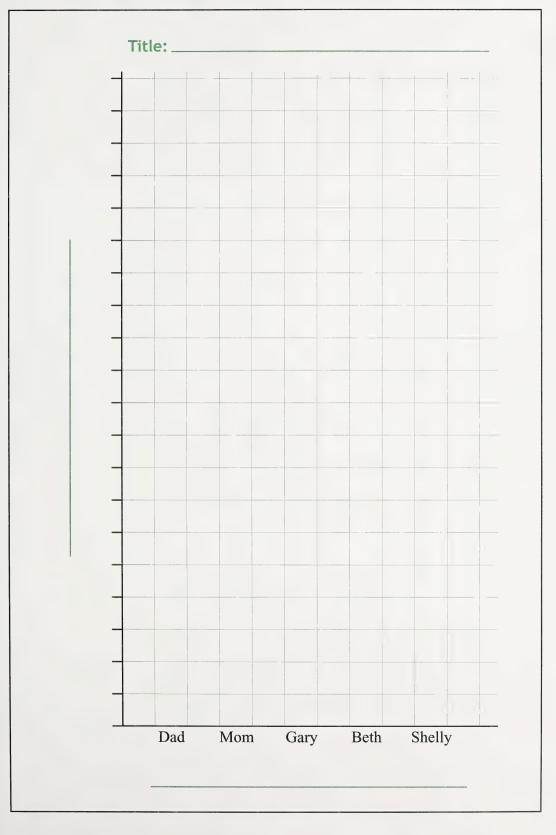


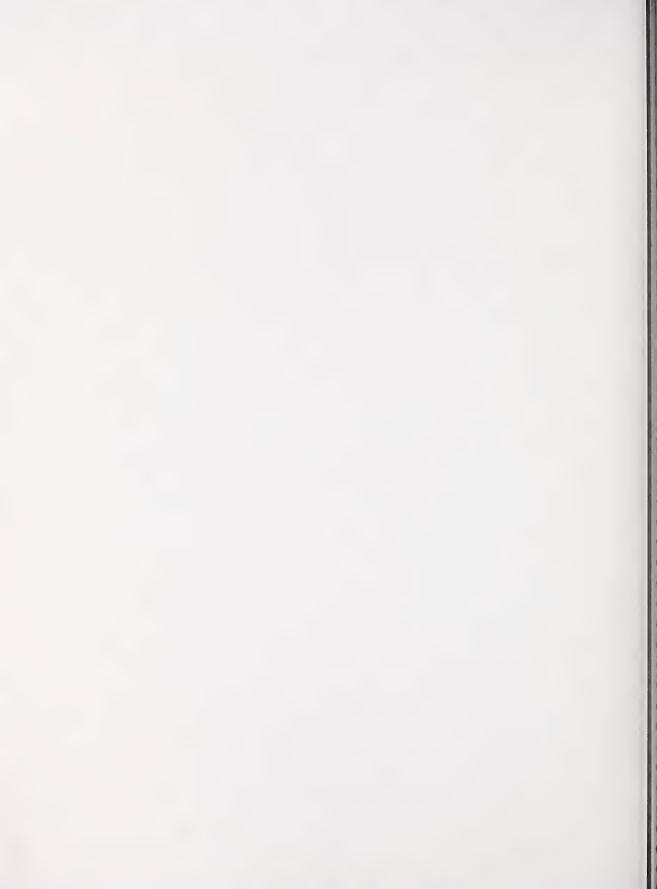
# Day 11: Graph Form for Pierre's Library





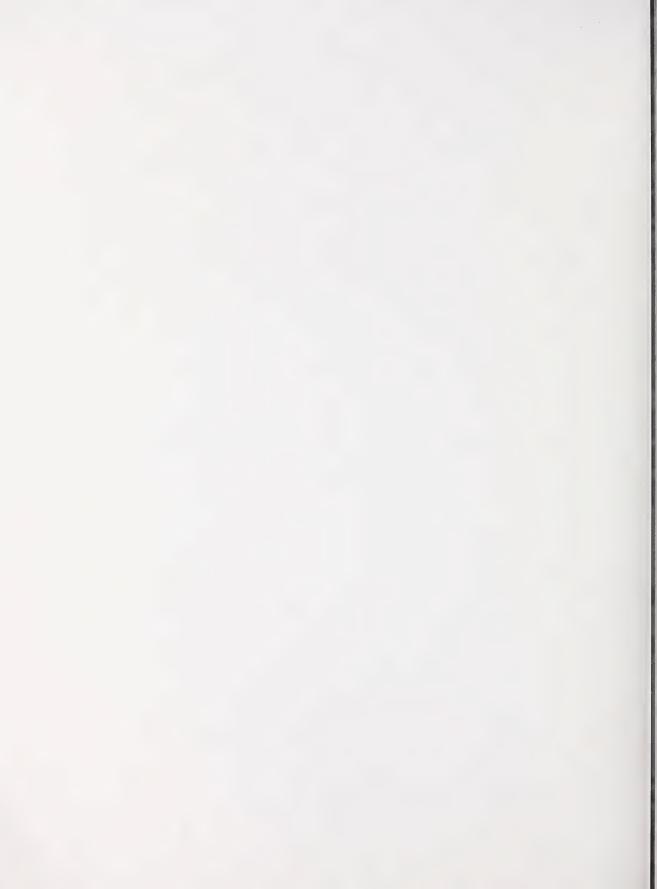
Day 12: Graph Form for the Blackwells



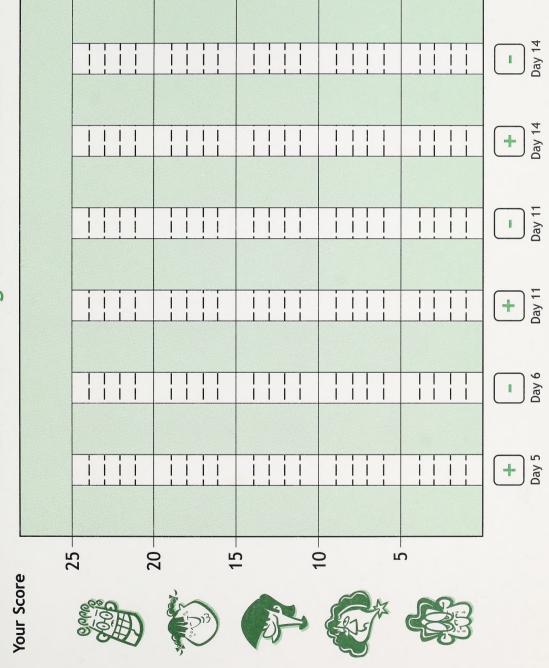


# Day 13: Graph Form for Animal Speeds

Title: \_\_\_\_\_



# Number Facts Progress Chart for Module 1









Mathematics 4 Student Module Booklet Module 1

2000